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RESULTS AND INTERPRETATION OF DRILLED-IN PILE TEST PROGRAM. EXI--ETC(U)

JUL 79 J PEREZ , S F GIZIENSKI

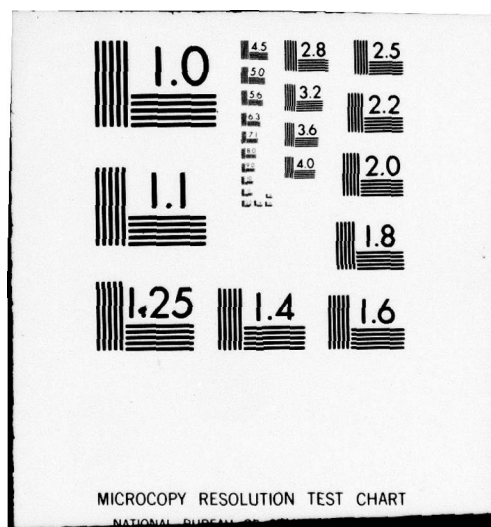
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# PHASE IV REPORT

VOLUME IVA

APPENDICES A THROUGH D

**LEVEL** *HH*

## RESULTS AND INTERPRETATION OF DRILLED-IN PILE TEST PROGRAM

*2*

EXISTING LOCKS AND DAM NO. 26  
MISSISSIPPI RIVER, ALTON, ILLINOIS

A 076096

Prepared for



United States Army  
Corps of Engineers

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... Serving the Nation

**St. Louis District**

By

Woodward-Clyde Consultants  
Chicago, Illinois

15 July 1979

Contract No. DACW43-78-C-0005

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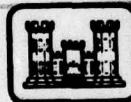
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PHASE IV REPORT  
VOLUME IVA  
APPENDICES A THROUGH D

6 RESULTS AND INTERPRETATION OF  
DRILLED-IN PILE TEST PROGRAM.

EXISTING LOCKS AND DAM NO. 26. Number  
MISSISSIPPI RIVER, ALTON, ILLINOIS.

Volume IVA. Appendices A through D.



United States Army  
Corps of Engineers

...Serving the Army  
...Serving the Nation

Phase IV Report.

St. Louis District

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By

Final rept.,

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10 Jean-Yves Perez

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Stanley F. Gizienki

Woodward-Clyde Consultants  
Chicago, Illinois

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15 July 1979

Contract No. DACW43-78-C-0005

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Lock and Dam No. 26, Mississippi River  Chemical grout test  Rock anchor test  Drilled-in pile test  Pile driving effects test </div> <div style="width: 50%;"> Timber piles  Alluvial sands  Benoto method  Instrumentation of tests  Vibrational effects on structures </div> </div>		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		
A series of tests examining various foundation systems and construction techniques were conducted on Ellis Island near Locks and Dam No. 26 in alluvial sand deposits underlain by glacial deposits and limestone. The chemical grout test consisted of grouting the upper 20 feet of the alluvial sand by injecting a number of different silicate and cement-bentonite grout types, while varying the grouting method, hole spacing, and injecting rates. Heave, lateral displacement, and pore pressure were monitored during grout injection. The in situ properties of the sand were measured before and after grouting by standard		

20. penetration tests, static cone penetration tests, pressuremeter tests, bore hole permeability tests, and shear wave velocity tests. Concurrently laboratory tests were conducted to investigate the strength and creep behavior of the grouted sand. After completion of grouting, the site was excavated to examine and evaluate the grouted sand. In the rock anchor test, inclined rock anchors were installed in limestone through 130 feet of alluvial and glacial deposits using a pneumatic down-the-hole hammer with an offset reamer. Load tests were conducted on three instrumentated rock anchors and the feasibility of installation of the rock anchors was determined by evaluating loss of ground during installation, performance of the installation equipment, and rate of installation. The drilled-in pile test consisted of installation of large diameter high capacity pipe piles by the Benoto method. The feasibility of installing these piles was determined by evaluating loss of ground during installation, performance of the Benoto equipment, and rate of installation. In the pile driving effects test, pile founded monoliths were constructed, supported on either one, eight or twelve timber piles jettied and driven in alluvial sand to a depth of 35 feet. After applying lateral and vertical load to the monoliths, steel piles were driven at varying distances from the monoliths while monitoring movement of the monolith and supporting piles; shear, moment, and axial load in the timber piles; and pore pressure, movement, and particle velocity; in the soil. Parameters examined were pile type being driven (sheet, pipe, or H-pile), pile driving hammer (diesel, air-steam, or vibratory), distance of driven piles from monolith, driving of multiple piles at the same distance from the monolith, load level applied to the monolith, and soil properties (grouted and ungrouted). Vertical and lateral load tests were conducted on each pile founded monolith. Tests were also conducted to assess what effect grouted soil has on piles. Piles were driven in both grouted and ungrouted sand to examine driving characteristics and lateral load tests were conducted on H and pipe piles in both grouted and ungrouted sand.

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**RESULTS AND INTERPRETATION OF  
DRILLED-IN PILE TEST PROGRAM**

**VOLUME IVA**

- |                   |  |
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| <b>Appendix B</b> | <b>EFFECTS OF DRILLING - GROUND MOVEMENTS</b>          |
| <b>Appendix C</b> | <b>EFFECTS OF DRILLING - CHANGE IN SOIL PROPERTIES</b> |
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**PHASE IV REPORT**

**VOLUME IVA**

**RESULTS AND INTERPRETATION OF  
DRILLED-IN PILE TEST PROGRAM**

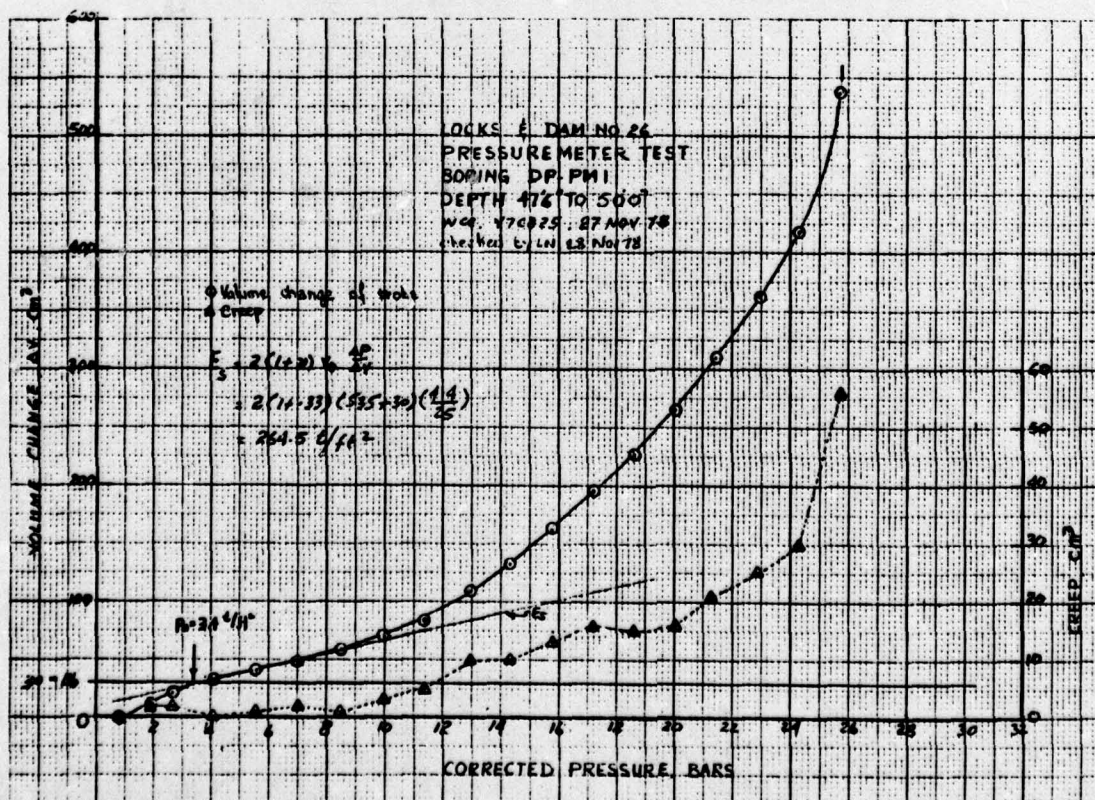
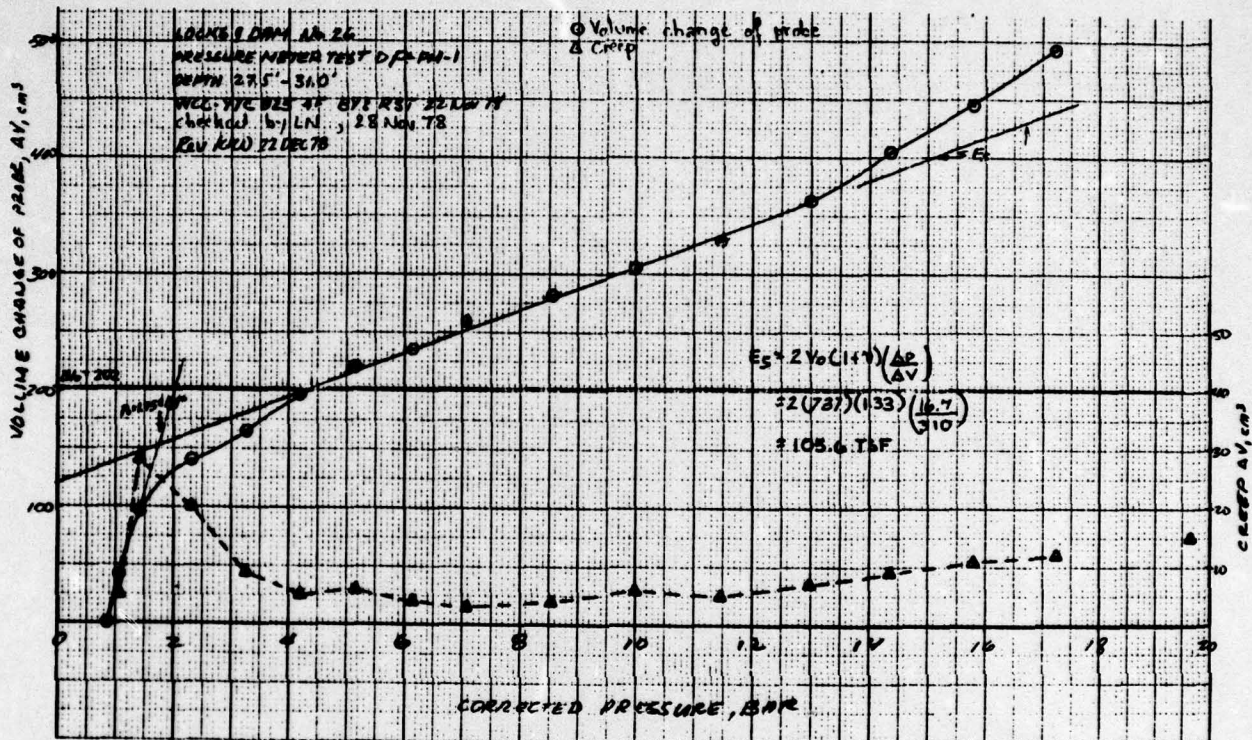
**APPENDIX A**

**TEST AREA SUBSURFACE CONDITIONS**

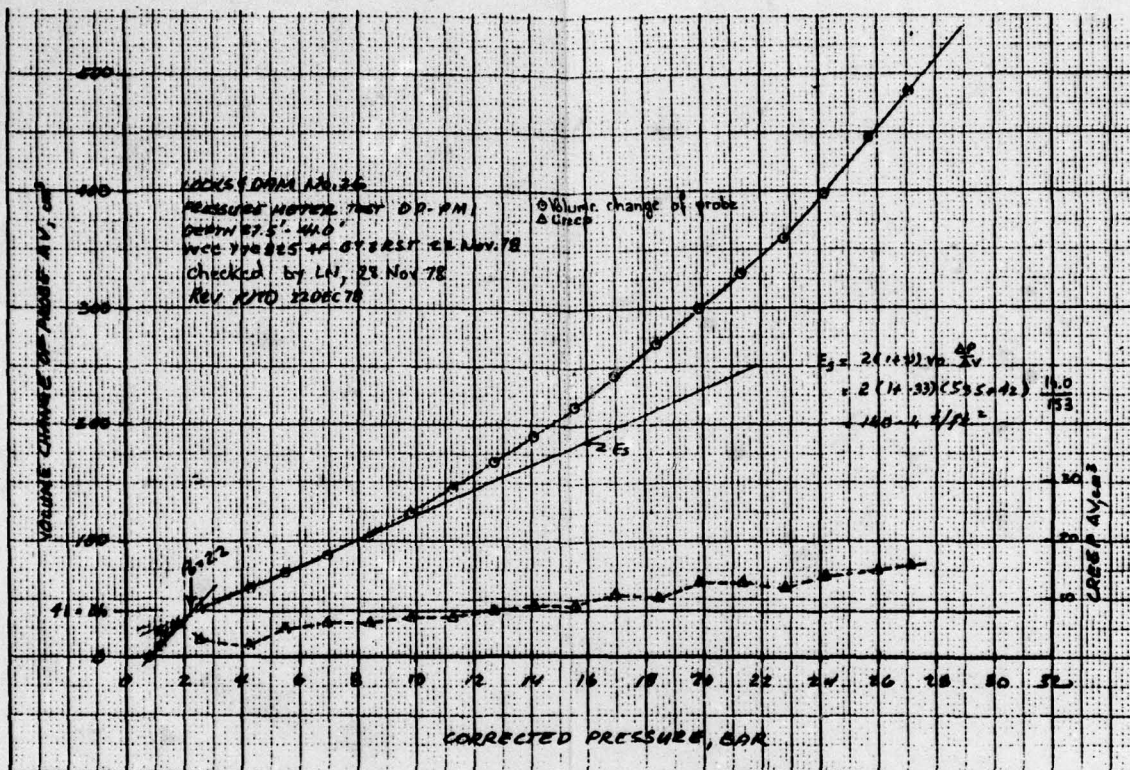


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### Legend

- Probe volume change versus corrected pressure
- Creep versus corrected pressure
- $P_0$  In situ horizontal stress
- $E_s$  Elastic deformation modulus
- $P_1$  Limit pressure


**DRILLED-IN PILE TEST PROGRAM**

**PRESSUREMETER TEST RESULTS  
BEFORE PILE INSTALLATION  
BORING DP-PM1**

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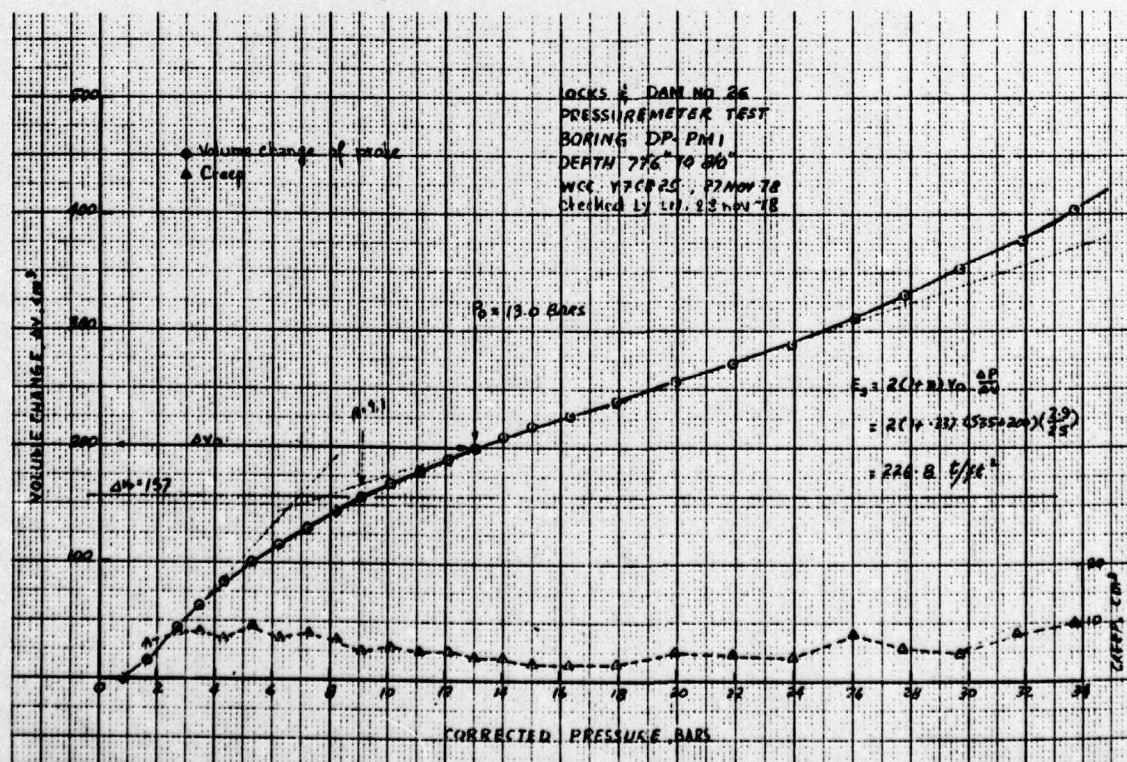
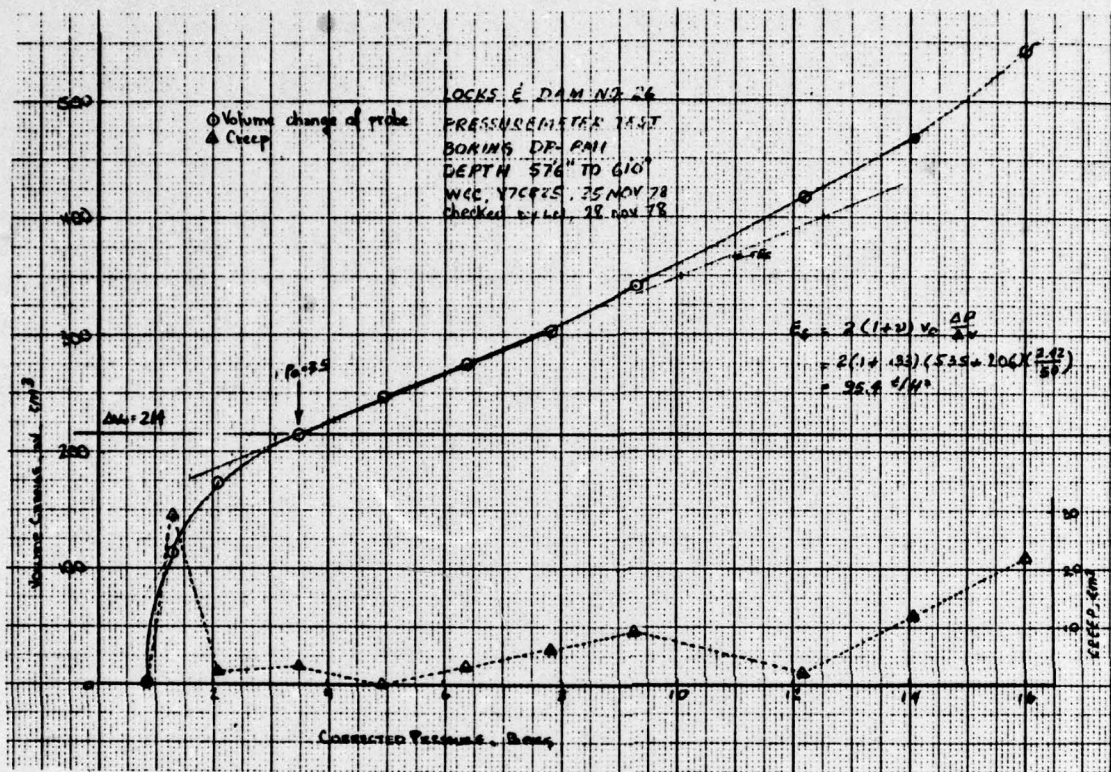
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 EXISTING LOCKS AND DAM No. 26  
 ST LOUIS DISTRICT, CORPS OF ENGINEERS.  
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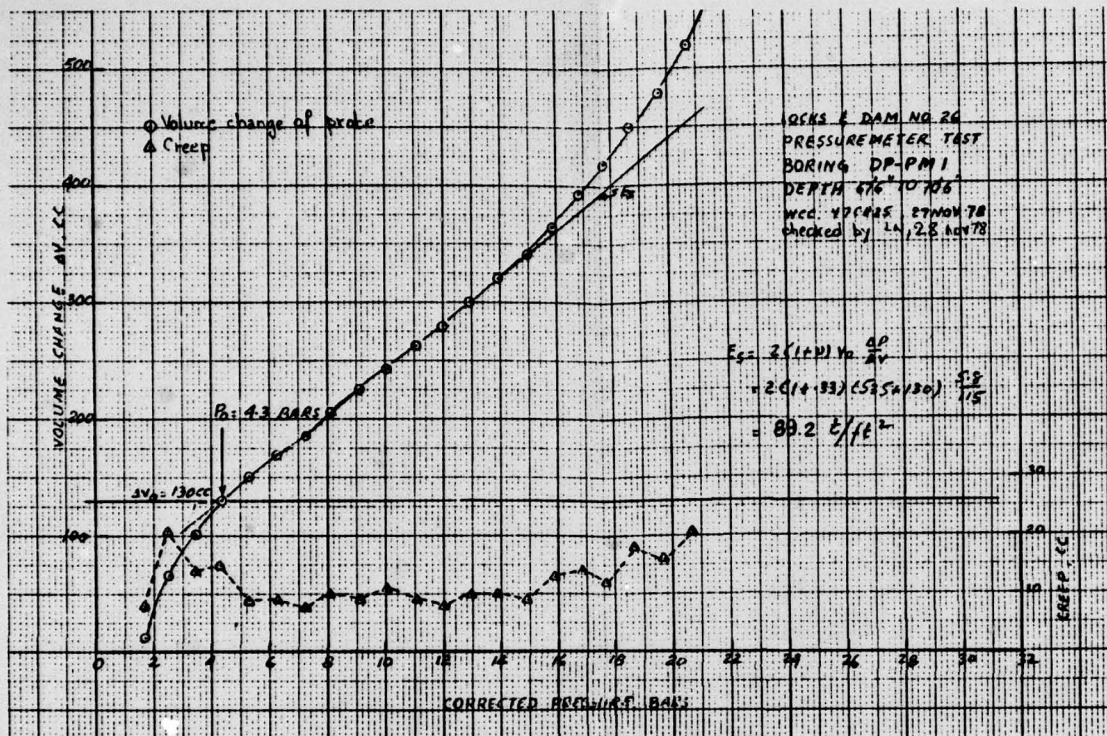


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Y7C825 Phase III

Fig. A.1 2



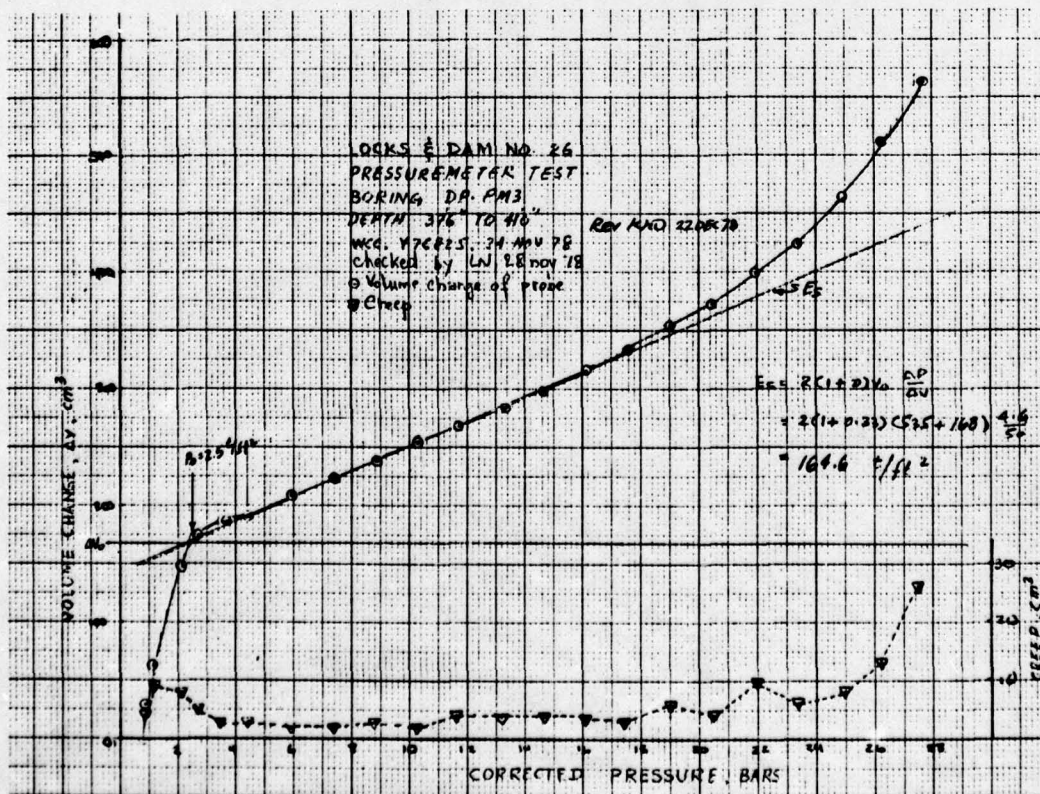
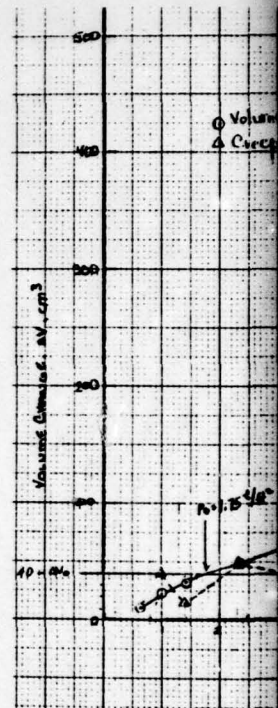
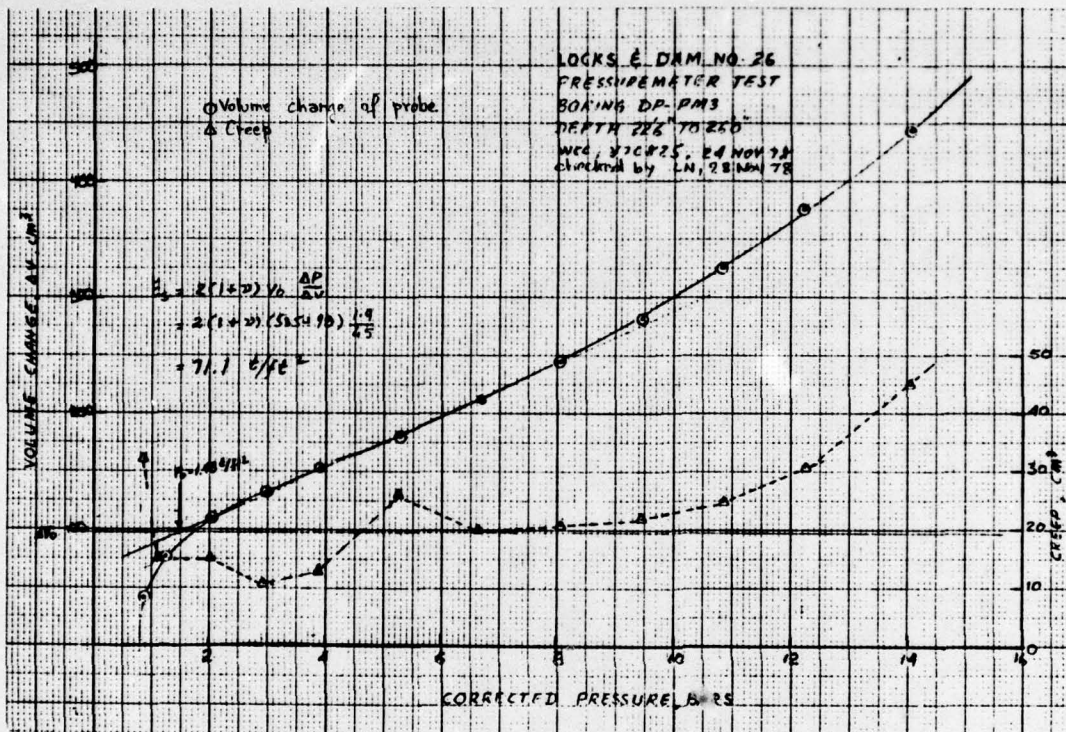




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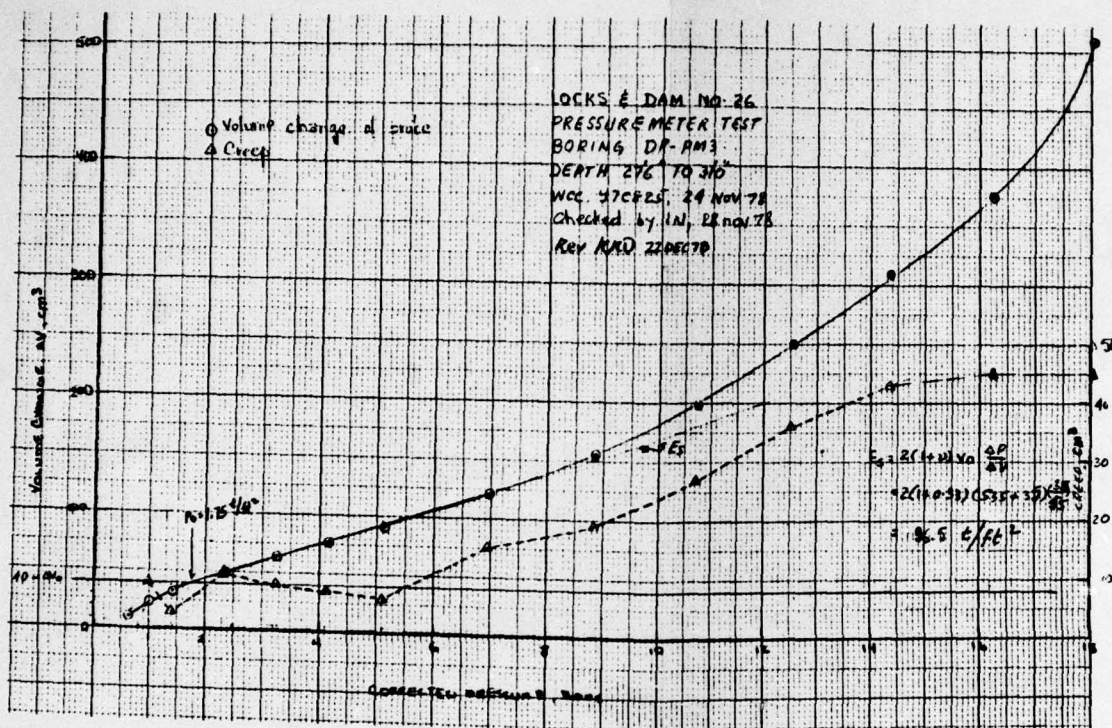
- Probe volume change versus corrected pressure
- Creep versus corrected pressure
- P<sub>0</sub> In situ horizontal stress
- E<sub>s</sub> Elastic deformation modulus
- P<sub>i</sub> Limit pressure

<b>DRILLED-IN PILE TEST PROGRAM</b>	
<b>PRESSUREMETER TEST RESULTS BEFORE PILE INSTALLATION BORING DP-PM1</b>	
FOUNDATION INVESTIGATION AND TEST PROGRAM EXISTING LOCKS AND DAM NO. 26 ST LOUIS DISTRICT, CORPS OF ENGINEERS. DACW43-78-C-0005	
Woodward-Clyde Consultants Y7C826 Phase III	<b>Fig. A.2</b>




○ Probe  
corr  
□ Creep  
pr  
 $P_0$  In  
 $E_s$  Elas  
mod  
 $P_1$  Lim

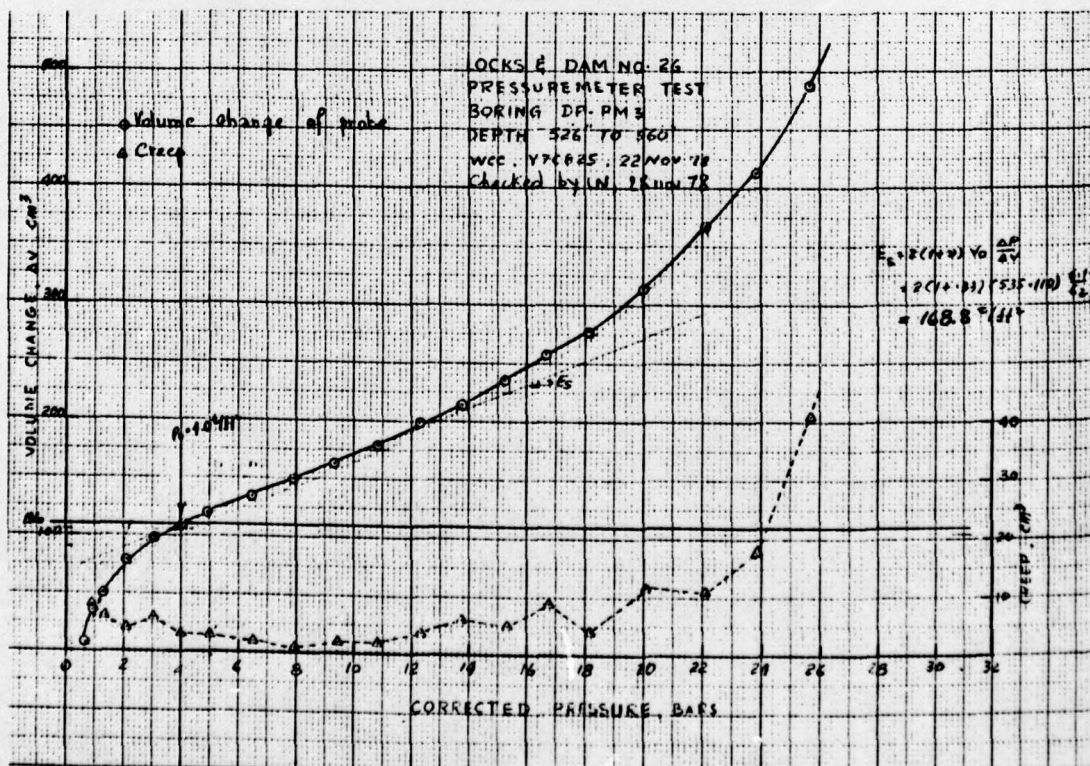
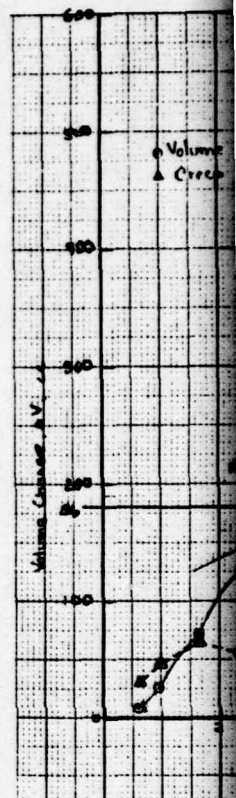
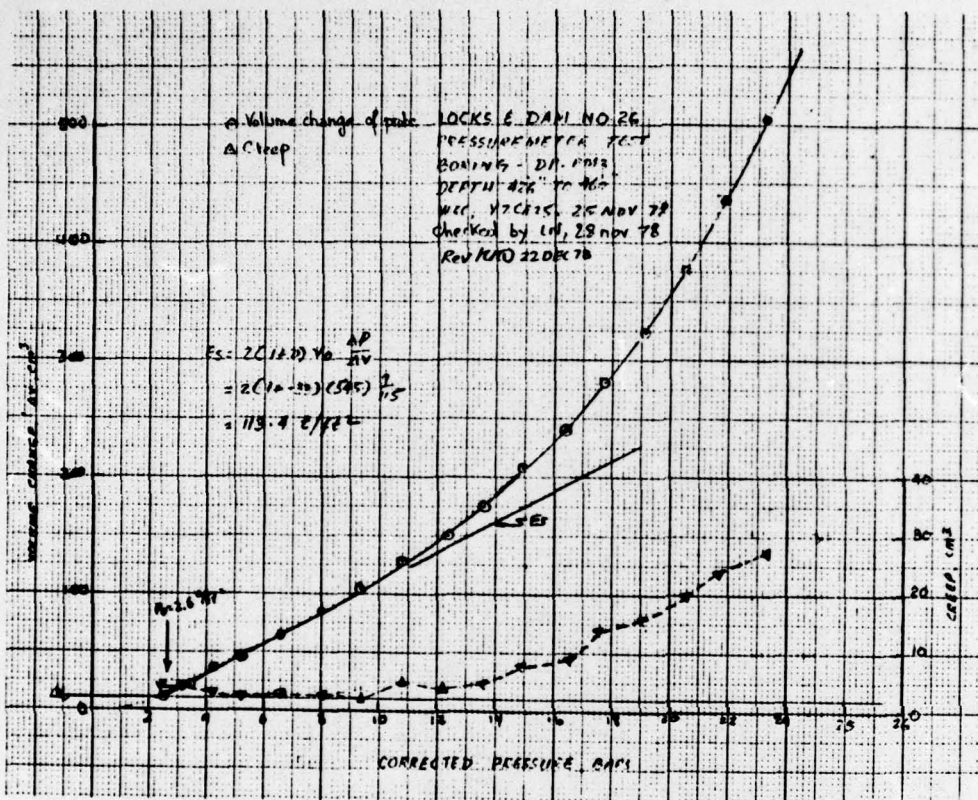




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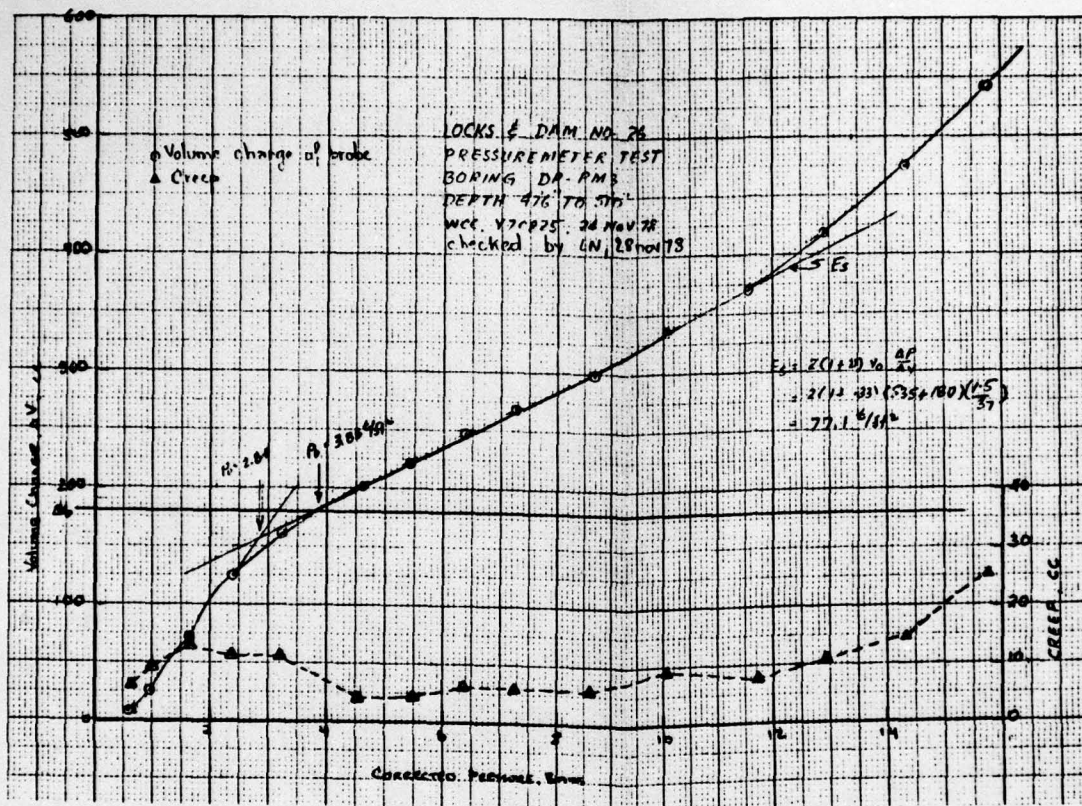
- Probe volume change versus corrected pressure
- △ Creep versus corrected pressure
- $P_0$  In situ horizontal stress
- $E_s$  Elastic deformation modulus
- $P_l$  Limit pressure

<b>DRILLED-IN PILE TEST PROGRAM</b>	
<b>PRESSUREMETER TEST RESULTS BEFORE PILE INSTALLATION BORING DP-PM3</b>	
FOUNDATION INVESTIGATION AND TEST PROGRAM EXISTING LOCKS AND DAM NO. 26 ST LOUIS DISTRICT, CORPS OF ENGINEERS. DACW43-78-C-0005	
 Woodward-Clyde Consultants YTC625 Phase II	<b>Fig. A.3</b>



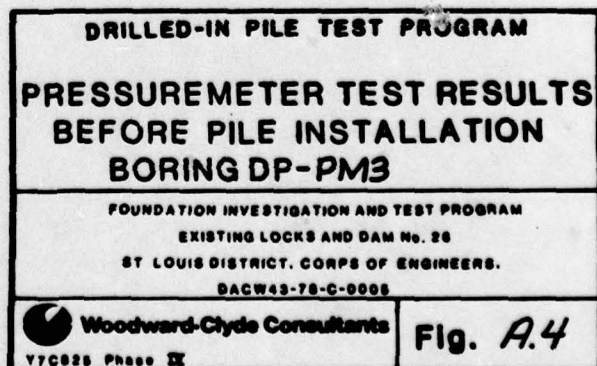
○ Pro  
cor  
□ Cre  
pro  
P<sub>0</sub> In  
E<sub>s</sub> Ela  
mo  
P<sub>1</sub> Lin

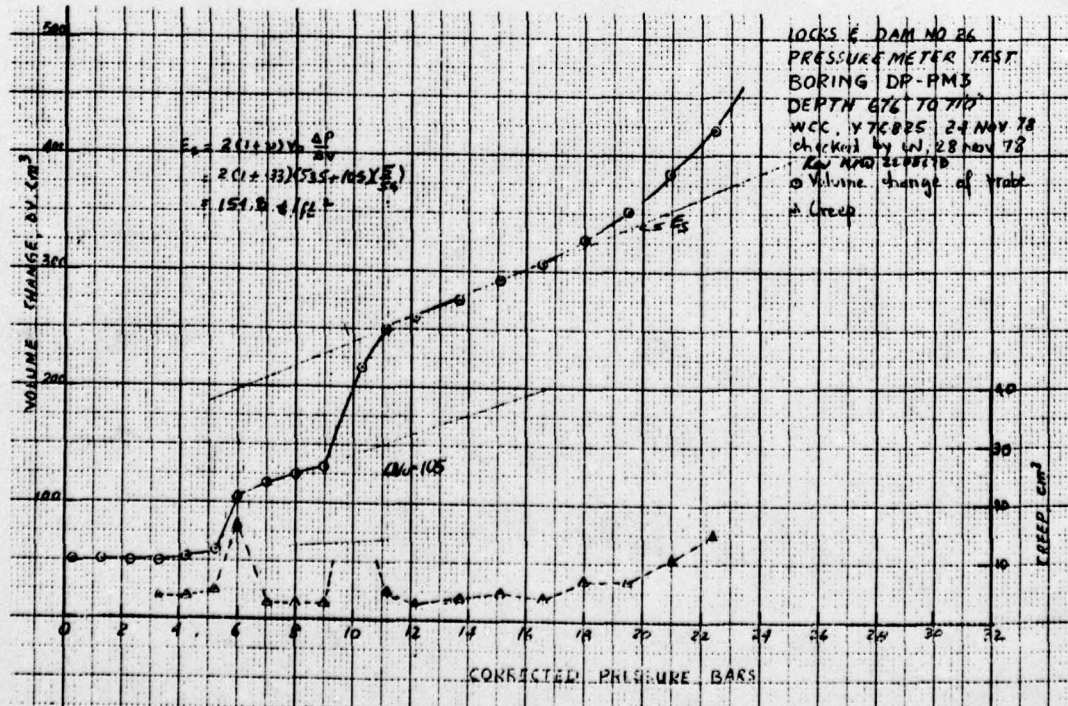
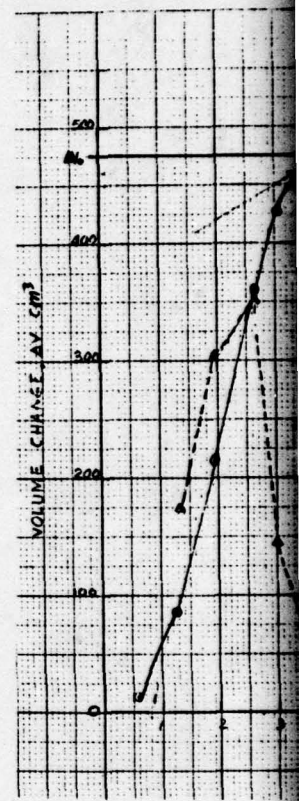
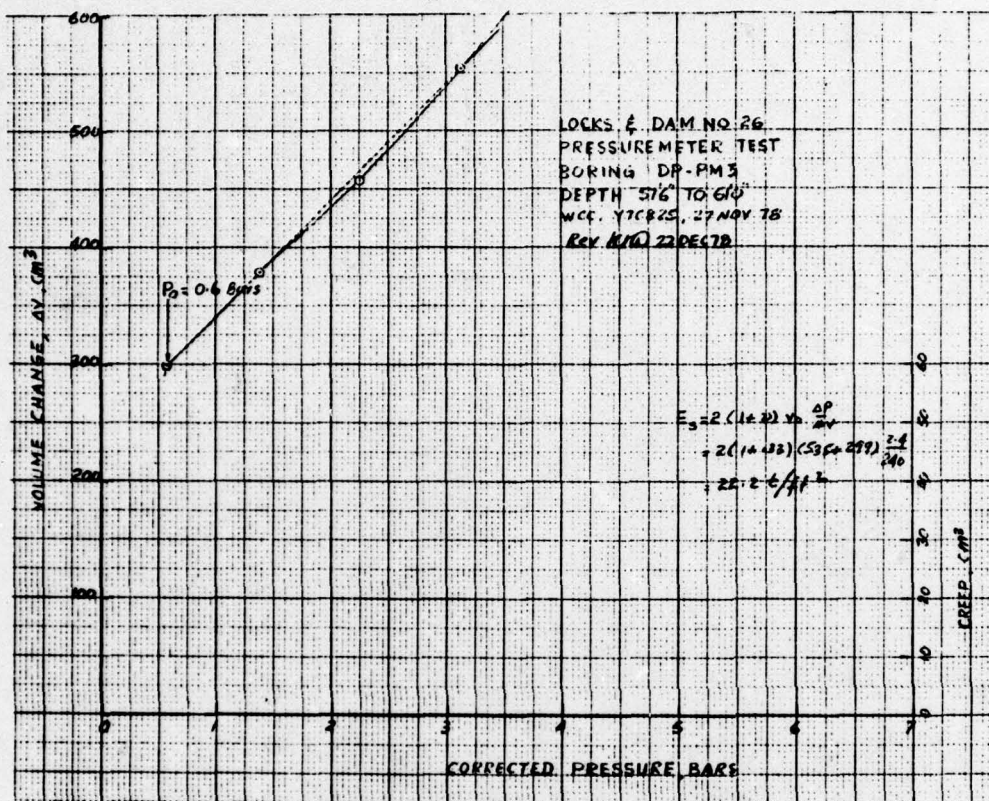




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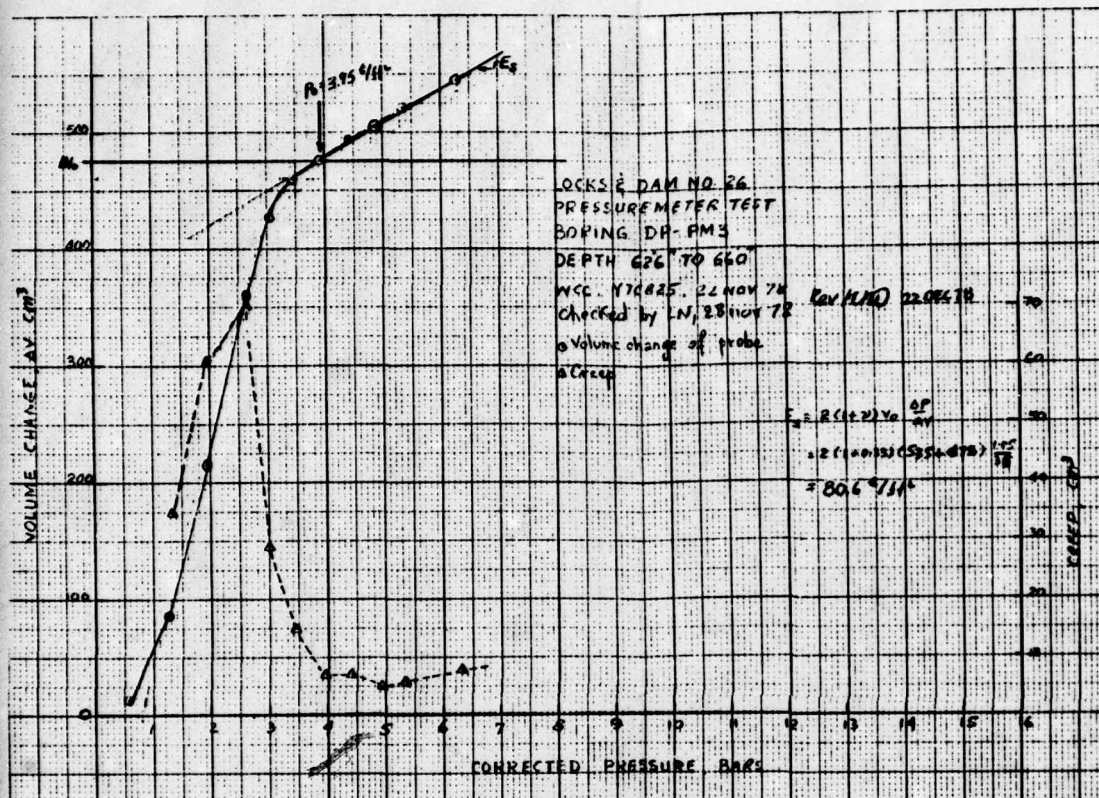
- Probe volume change versus corrected pressure
- Creep versus corrected pressure
- $P_0$  In situ horizontal stress
- $E_s$  Elastic deformation modulus
- $P_1$  Limit pressure






- Legend
- Probe volume corrected
  - Creep versus pressure
  - $P_0$  In situ horizontal
  - $E_s$  Elastic deformation modulus
  - $P_1$  Limit pressure

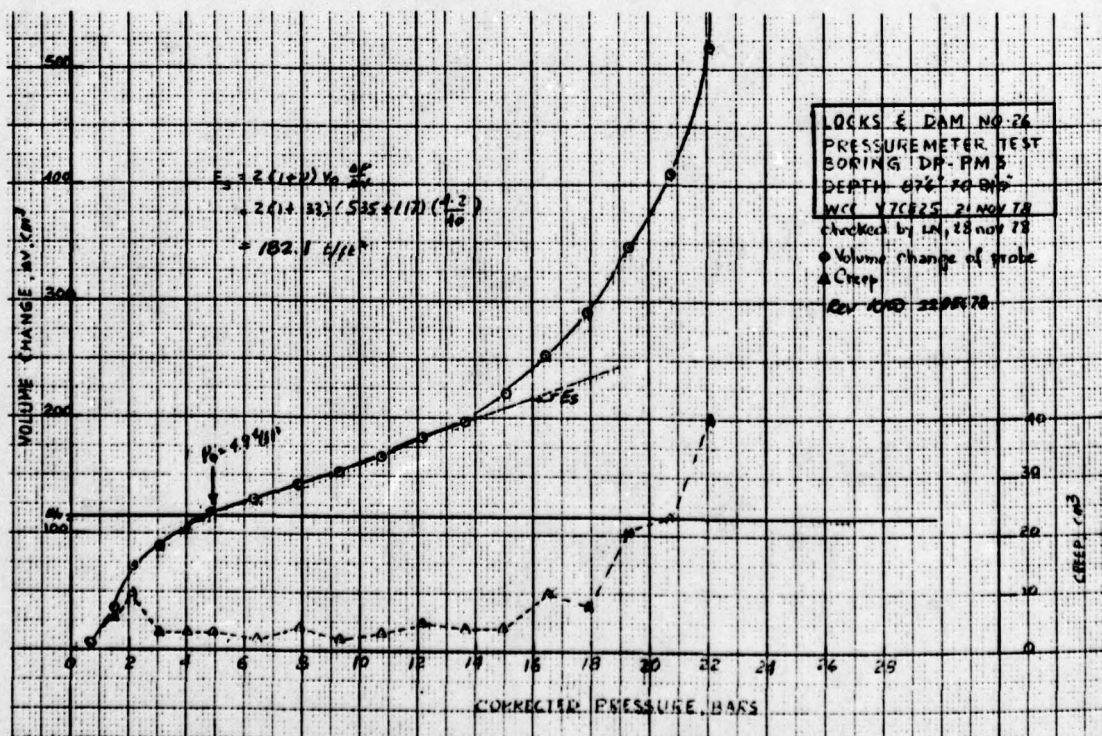
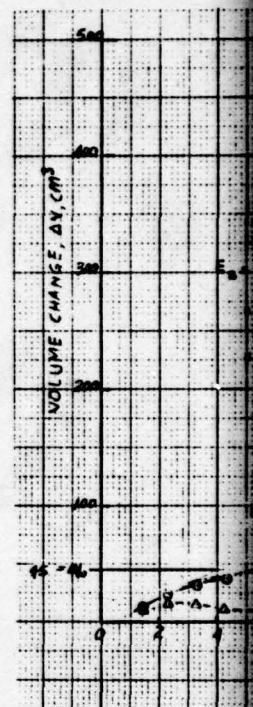
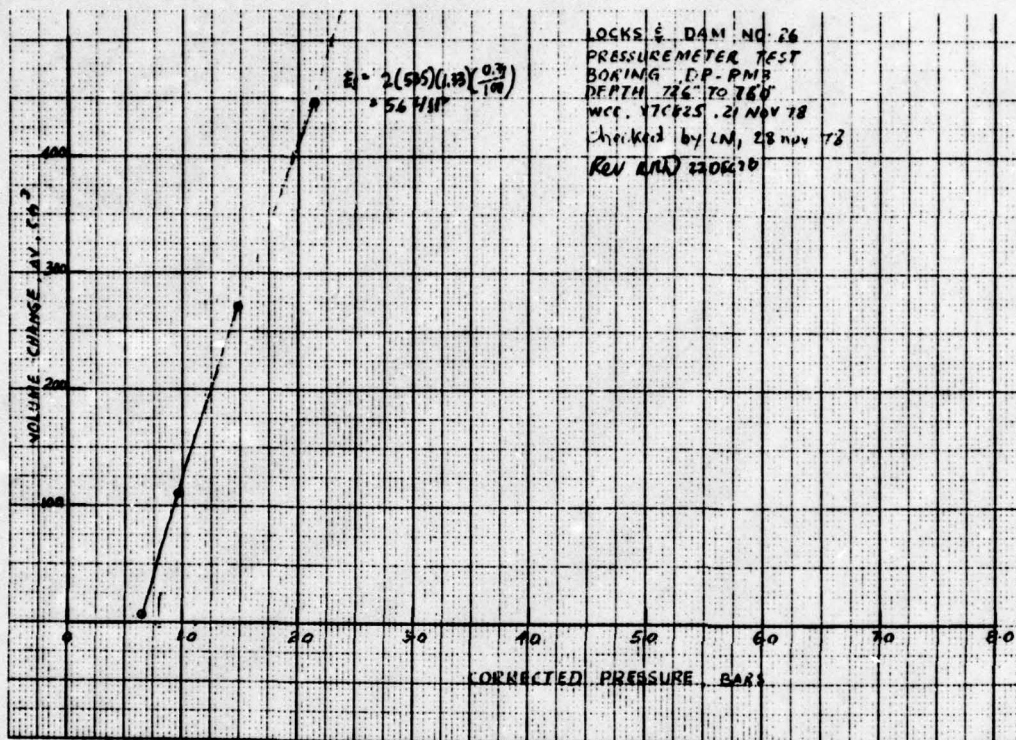




#### Legend

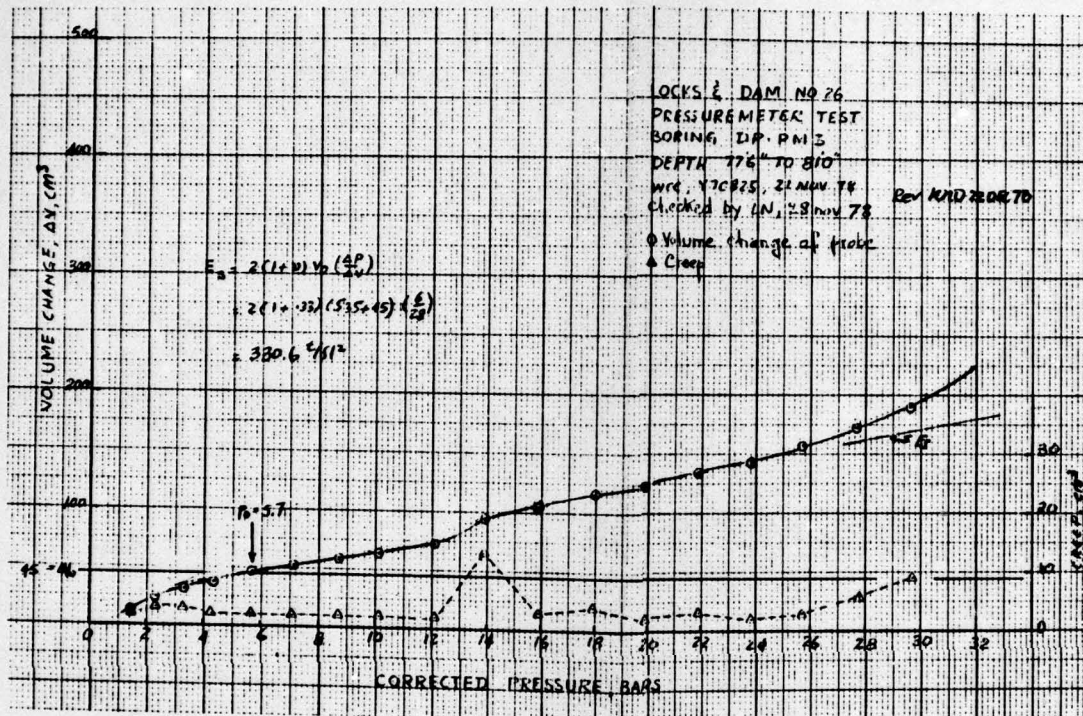
- o Probe volume change versus corrected pressure
- Creep versus corrected pressure
- $P_0$  In situ horizontal stress
- $E_s$  Elastic deformation modulus
- $P_L$  Limit pressure

<p align="center"><b>DRILLED-IN PILE TEST PROGRAM</b></p> <p align="center"><b>PRESSUREMETER TEST RESULTS</b></p> <p align="center"><b>BEFORE PILE INSTALLATION</b></p> <p align="center"><b>BORING DP-PM3</b></p>	
<p align="center">FOUNDATION INVESTIGATION AND TEST PROGRAM</p> <p align="center">EXISTING LOCKS AND DAM No. 26</p> <p align="center">ST. LOUIS DISTRICT, CORPS OF ENGINEERS.</p> <p align="center">DACW43-78-C-0005</p>	
<p align="center"> Woodward-Clyde Consultants</p> <p align="center">YTC825 Photo IX</p>	<p align="center"><b>Fig. A.5</b></p>



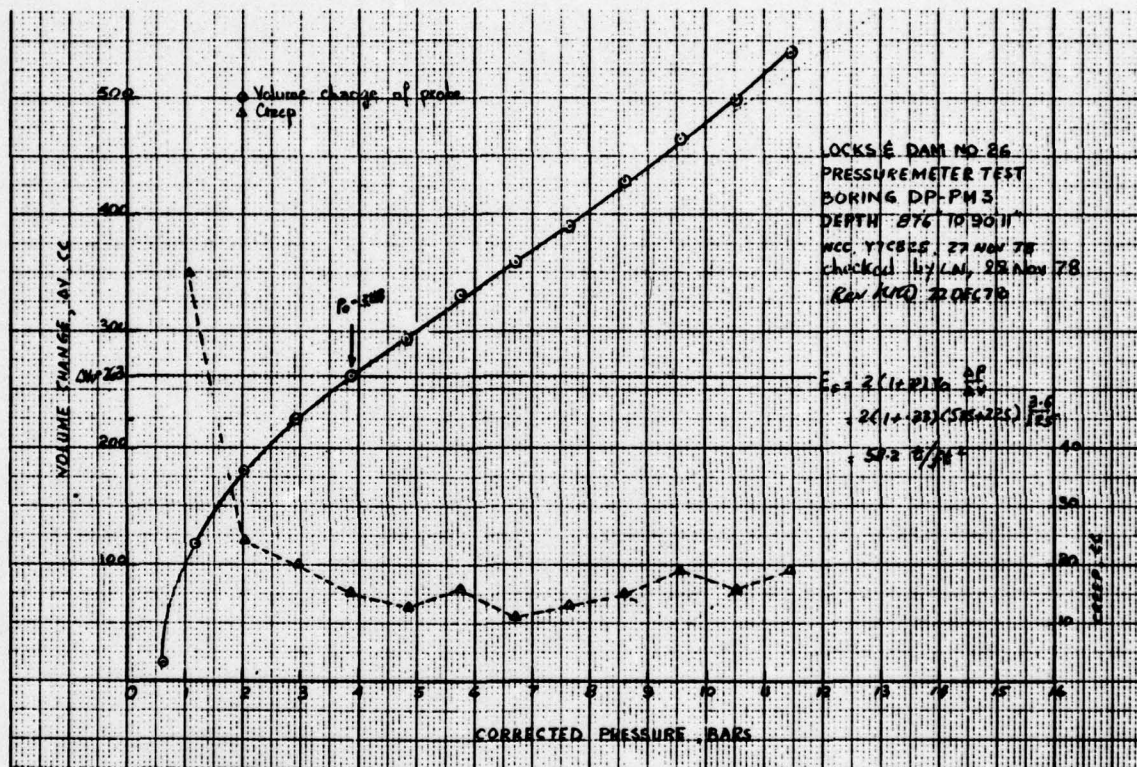
○ Probe  
corro  
□ Creep  
press  
 $P_0$  In air  
 $E_s$  Elastic  
modu  
 $P_1$  Limit






- Legend**
- Probe volume change versus corrected pressure
  - Creep versus corrected pressure
  - $P_0$  In situ horizontal stress
  - $E_s$  Elastic deformation modulus
  - $P_l$  Limit pressure

<b>DRILLED-IN PILE TEST PROGRAM</b>	
<b>PRESSUREMETER TEST RESULTS BEFORE PILE INSTALLATION BORING DP-PM3</b>	
FOUNDATION INVESTIGATION AND TEST PROGRAM EXISTING LOCKS AND DAM No. 26 ST LOUIS DISTRICT, CORPS OF ENGINEERS. DACW43-78-C-0008	
Woodward-Clyde Consultants Y7C825 Phase III	<b>Fig. A.6</b>

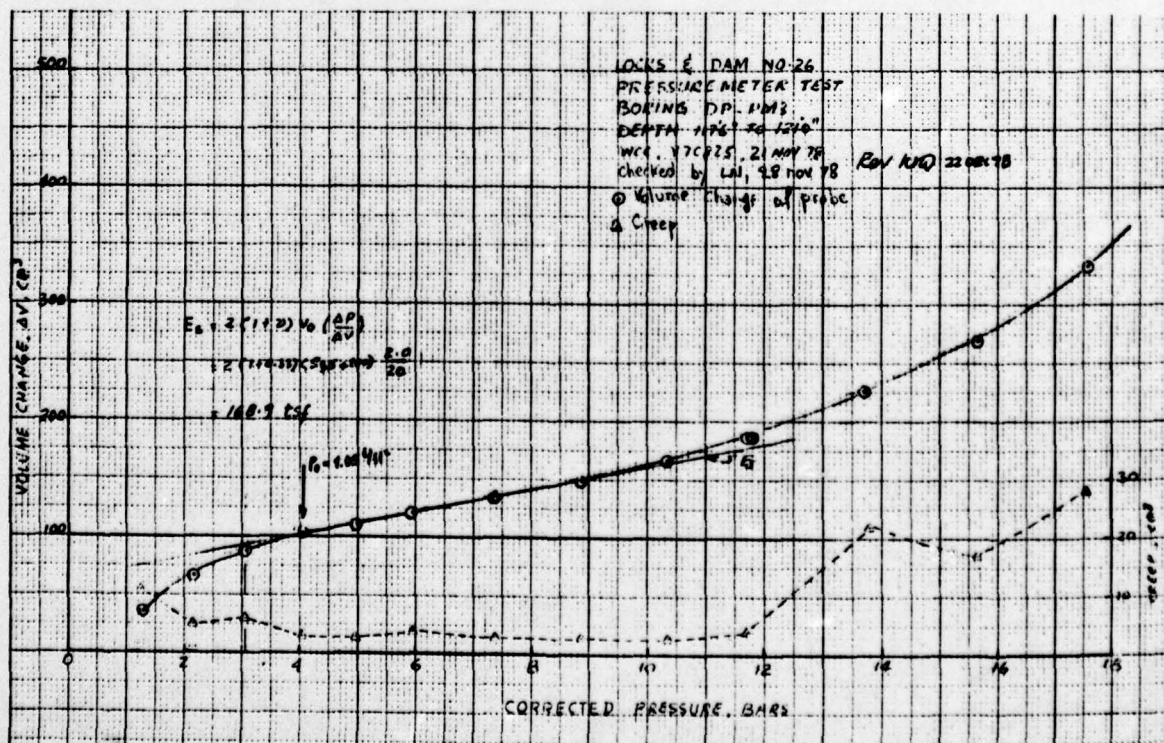
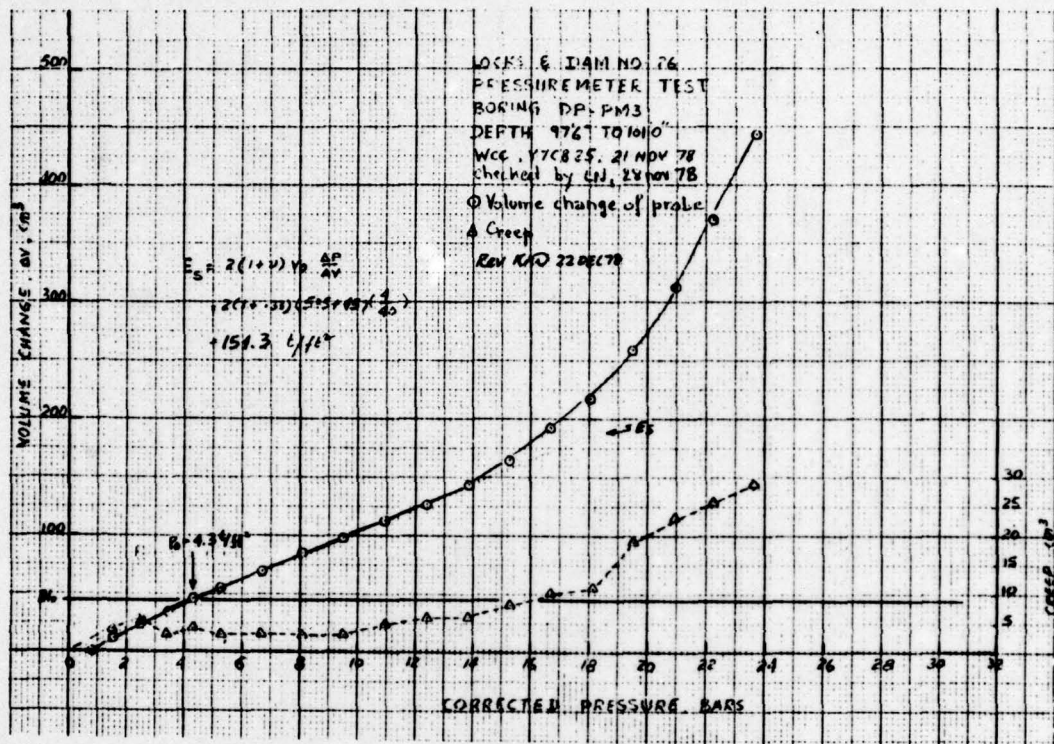


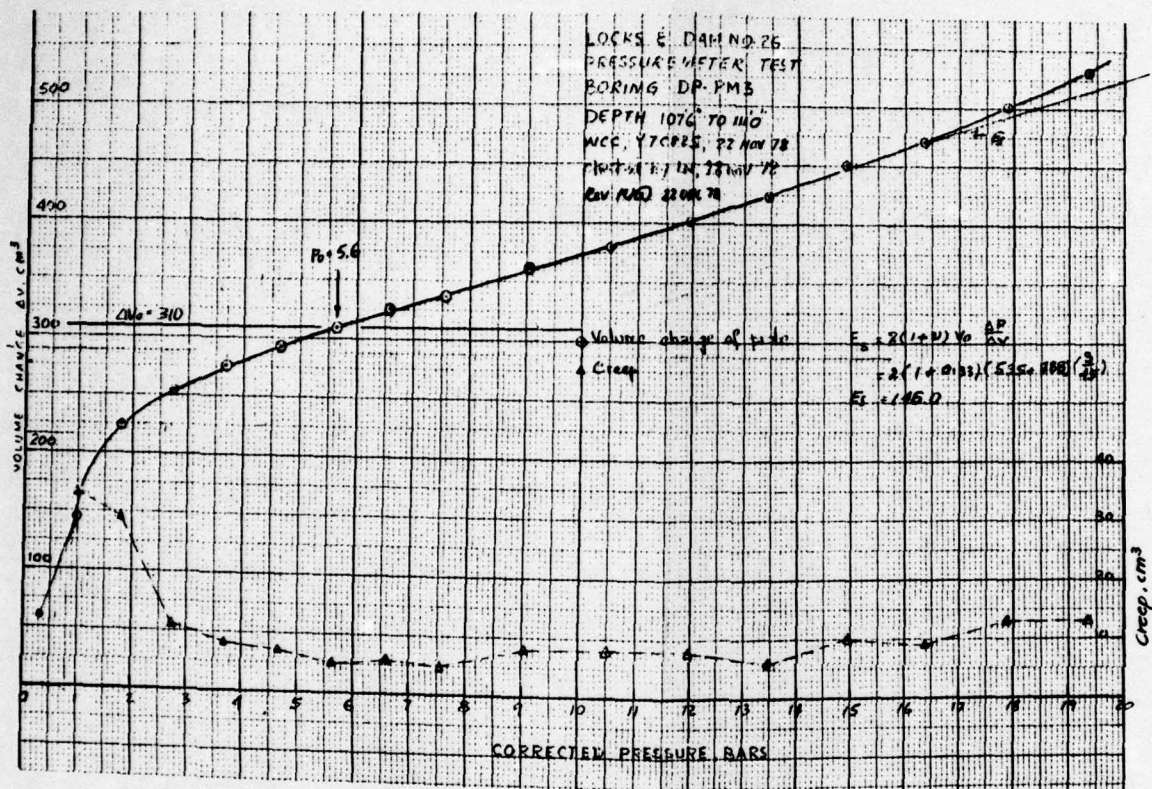
**Legend**

- Probe volume change versus corrected pressure
- △ Creep versus corrected pressure
- $P_0$  In situ horizontal stress
- $E_s$  Elastic deformation modulus
- $P_l$  Limit pressure

<b>DRILLED-IN PILE TEST PROGRAM</b>	
<b>PRESSUREMETER TEST RESULTS BEFORE PILE INSTALLATION BORING DP-PM3</b>	
FOUNDATION INVESTIGATION AND TEST PROGRAM EXISTING LOCKS AND DAM NO. 26 ST LOUIS DISTRICT, CORPS OF ENGINEERS. DACW43-78-C-0005	
 Woodward-Clyde Consultants YTCB25 Phase III	<b>Fig. A.7</b>



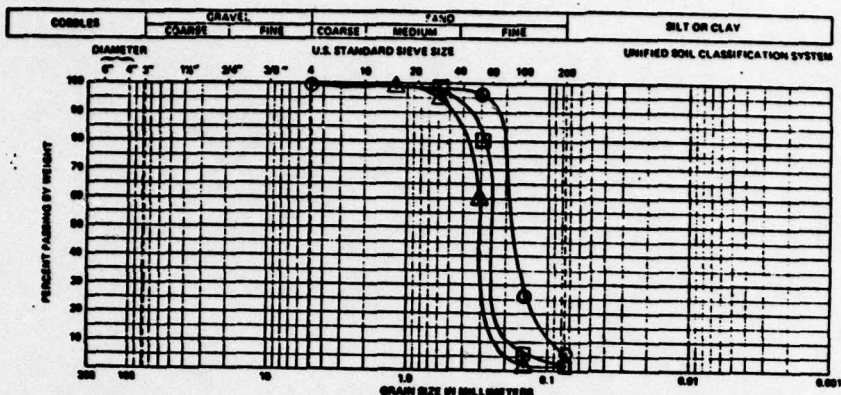




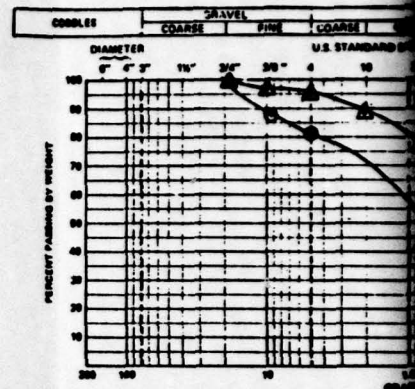
- Legend**
- Probe volume change versus corrected pressure
  - △ Creep versus corrected pressure
  - $P_0$  In situ horizontal stress
  - $E_s$  Elastic deformation modulus
  - $P_i$  Limit pressure

<b>DRILLED-IN PILE TEST PROGRAM</b>	
<b>PRESSUREMETER TEST RESULTS BEFORE PILE INSTALLATION BORING DP-PM3</b>	
FOUNDATION INVESTIGATION AND TEST PROGRAM EXISTING LOCKS AND DAM NO. 26 ST. LOUIS DISTRICT, CORPS OF ENGINEERS. DACW43-78-C-0005	
Woodward-Clyde Consultants Y7C825 Phase III	<b>Fig. A.8</b>

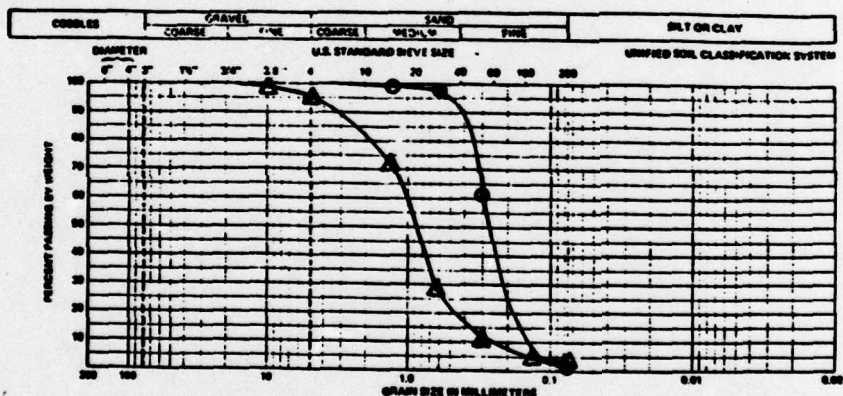




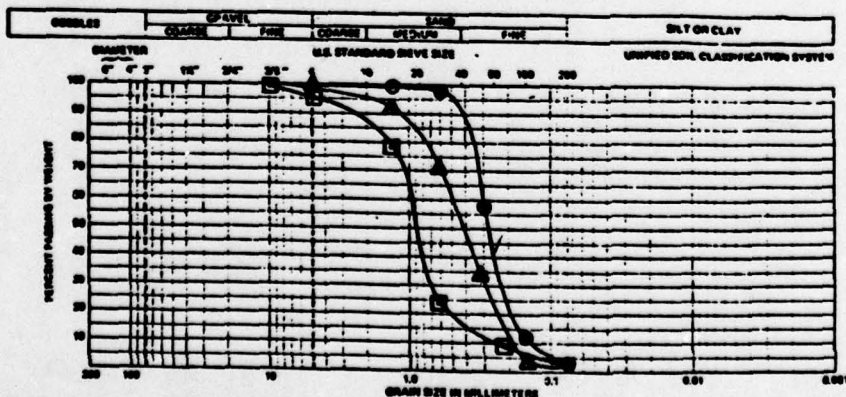
BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	$w(15)$	$w_p(15)$	$w_{p(15)}$
C-4	S-2	14.5'	○	SP, brown f SAND, trace silt			
C-4	S-3	20'	△	SP, brown f SAND, trace silt			
C-4	S-4	25'	□	SP, brown-gray f SAND, trace silt			



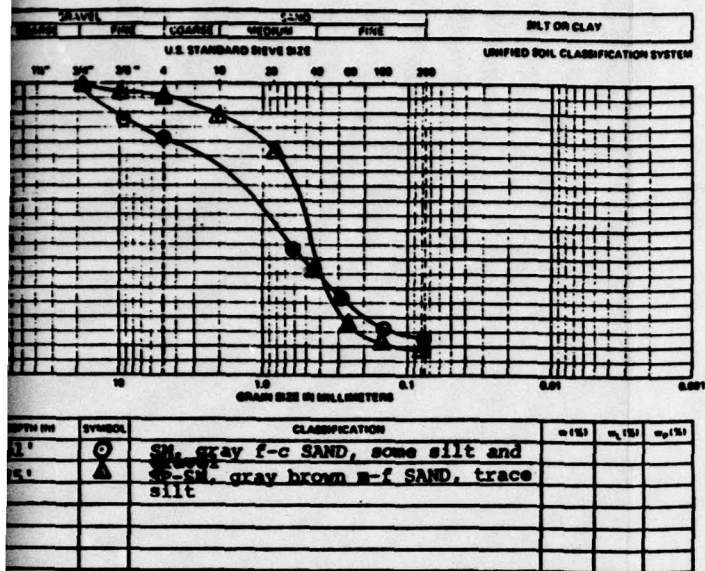
BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	$w(15)$	$w_p(15)$	$w_{p(15)}$
C-4	S-10	61'	○	SM, gray f SAND, trace silt			
C-4	S-5	75'	△	SC-SM, gray f SAND, trace silt			



BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	$w(15)$	$w_p(15)$	$w_{p(15)}$
C-4	S-5	30'	○	SP, gray f SAND, trace silt	(H)		
C-4	S-6	40'	△	SP, gray f-c SAND, trace silt and gravel	(F)		



BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	$w(15)$	$w_p(15)$	$w_{p(15)}$
C-4	S-7	45'	○	SP, gray f SAND, trace silt			
C-4	S-8	50'	△	SP, gray f-m SAND, trace silt and gravel			
C-4	S-9	55'	□	SP, gray f-m SAND, trace silt and gravel			



**DRILLED-IN PILE TEST PROGRAM**

**GRAIN-SIZE DISTRIBUTIONS  
OF C SERIES BORINGS**

FOUNDATION INVESTIGATION AND TEST PROGRAM  
EXISTING LOCKS AND DAM NO. 26  
ST LOUIS DISTRICT, CORPS OF ENGINEERS.  
DACW43-78-C-0005

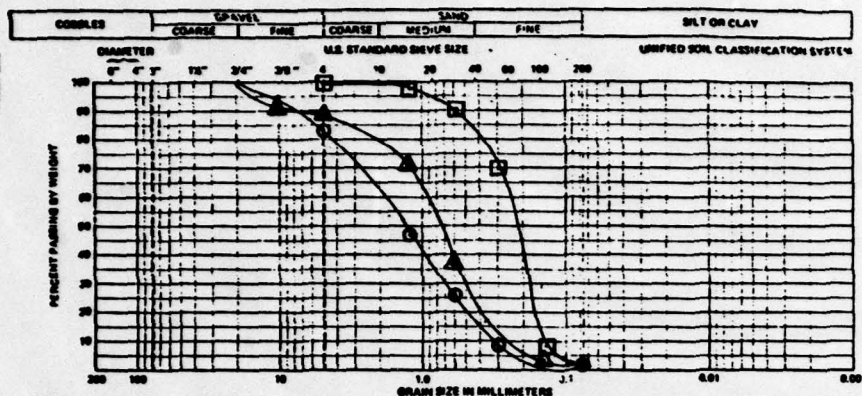
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**Fig. A.9**

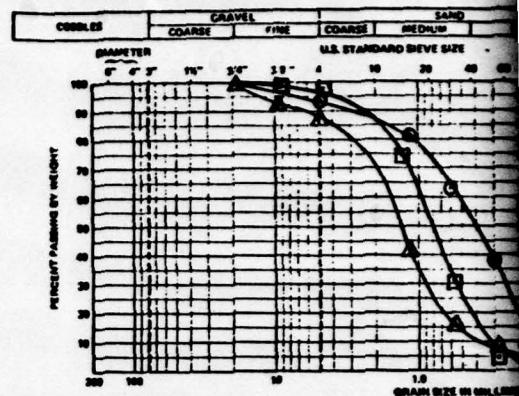
Y7C825 Phase II

2

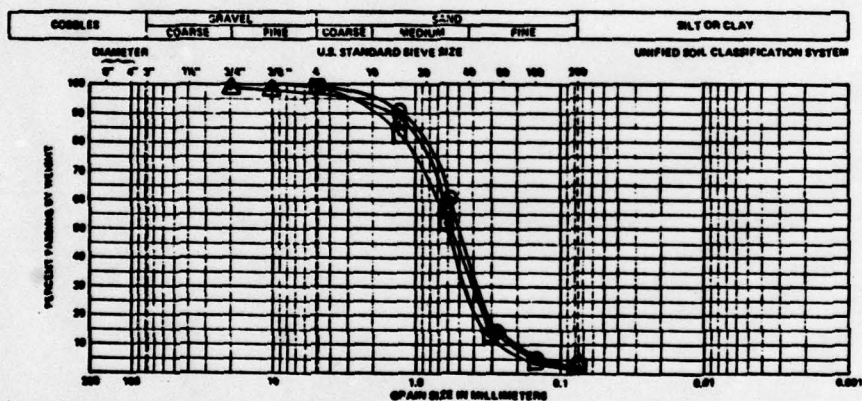




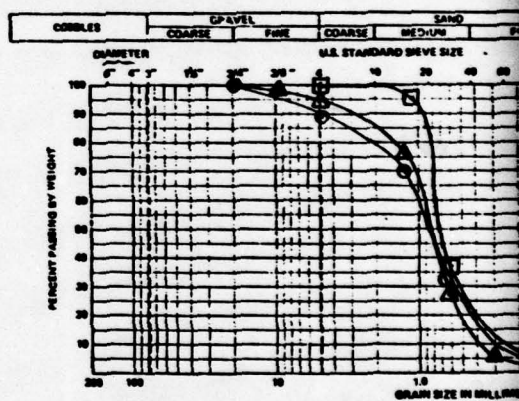
BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	e <sub>s</sub> (%)	w <sub>p</sub> (%)
C-7	S-5	24.5'	○	SP, gray f-c SAND, some gravel			
C-7	S-6	29.5'	△	SP, gray f-m SAND, trace gravel			
C-7	S-7	34.5'	□	SP, gray f SAND, trace silt			



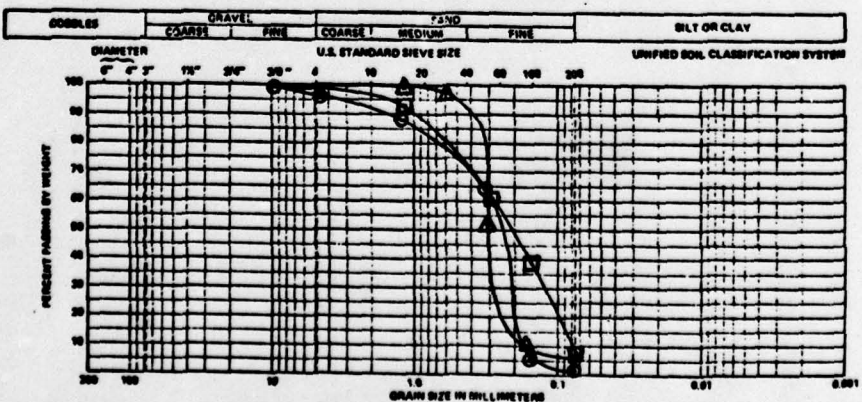
BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	e <sub>s</sub> (%)	w <sub>p</sub> (%)
C-7	S-14	69.5'	○	SP, gray f-m SAND,			
C-7	S-15	74.5'	△	SP, gray m-c SAND, fine sand			
C-7	S-16	79.5'	□	SP, gray c-m SAND, fine sand			



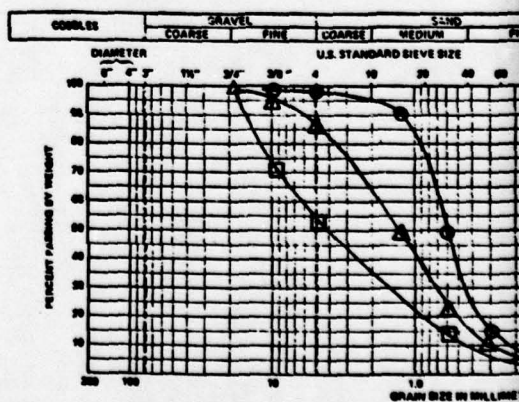
BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	e <sub>s</sub> (%)	w <sub>p</sub> (%)
C-7	S-8	39.5'	○	SP, gray f-m SAND, trace gravel			
C-7	S-9	44.5'	△	SP, gray f-m SAND, trace gravel			
C-7	S-10	49.5'	□	SP, gray f-m SAND, trace gravel			



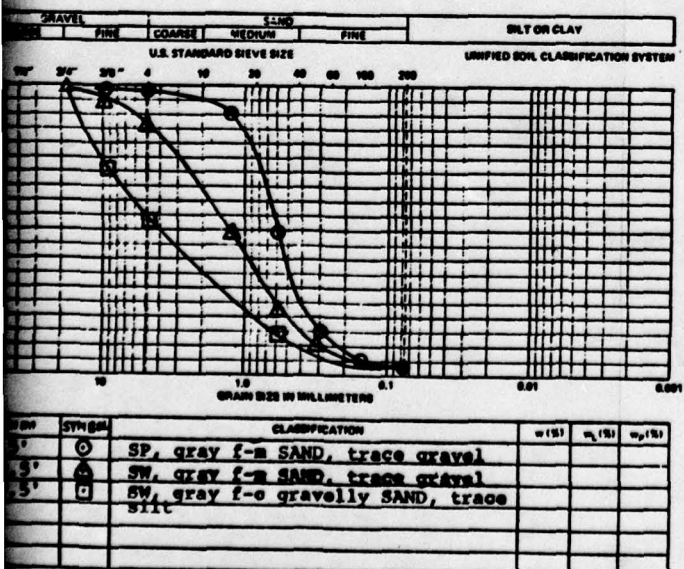
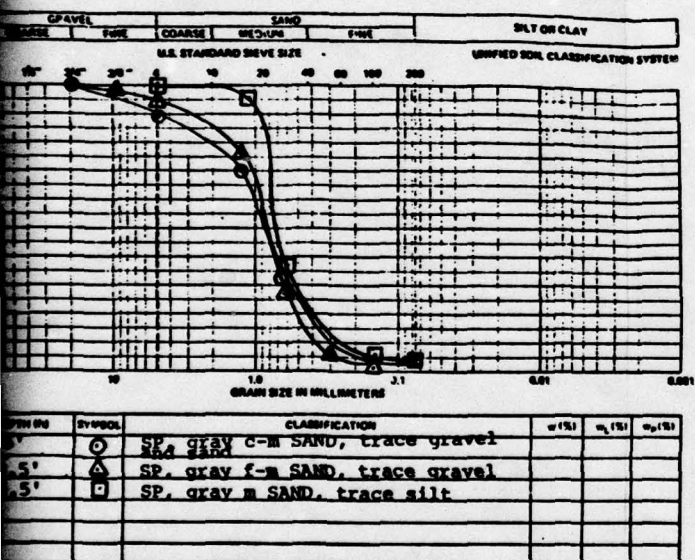
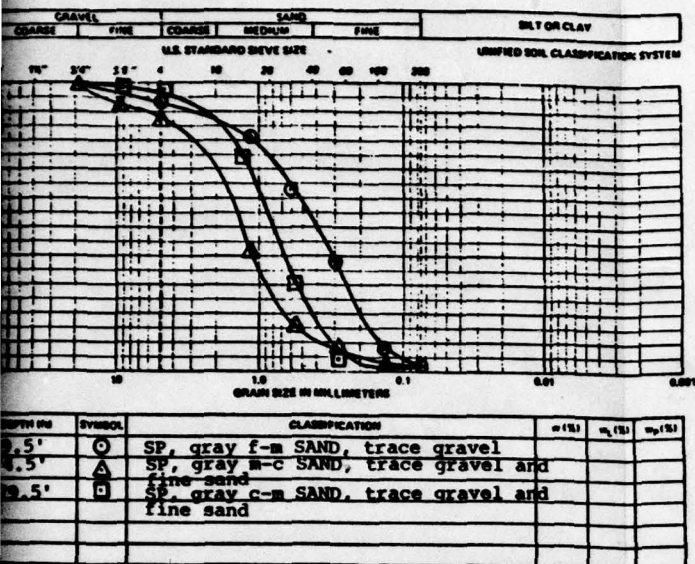
BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	e <sub>s</sub> (%)	w <sub>p</sub> (%)
C-7	S-17	85'	○	SP, gray c-m SAND, trace gravel			
C-7	S-18	89.5'	△	SP, gray f-m SAND, trace gravel			
C-7	S-19	94.5'	□	SP, gray m SAND, trace silt			



BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	e <sub>s</sub> (%)	w <sub>p</sub> (%)
C-7	S-11	54.5'	○	SP, gray f-m SAND, trace gravel			
C-7	S-12	59.5'	△	SP-SM, gray f SAND, trace silt			
C-7	S-13	64.5'	□	SP-SM, gray f-m SAND, trace silt			



BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	e <sub>s</sub> (%)	w <sub>p</sub> (%)
C-7	S-20	99.5'	○	SP, gray f-m SAND, trace gravel			
C-7	S-21	104.5'	△	SW, gray f-m SAND, trace silt			
C-7	S-22	109.5'	□	SW, gray f-c gravel, silt			



## DRILLED-IN PILE TEST PROGRAM

### GRAIN-SIZE DISTRIBUTIONS OF C SERIES BORINGS

FOUNDATION INVESTIGATION AND TEST PROGRAM

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ST. LOUIS DISTRICT, CORPS OF ENGINEERS.

DACW43-78-C-0005

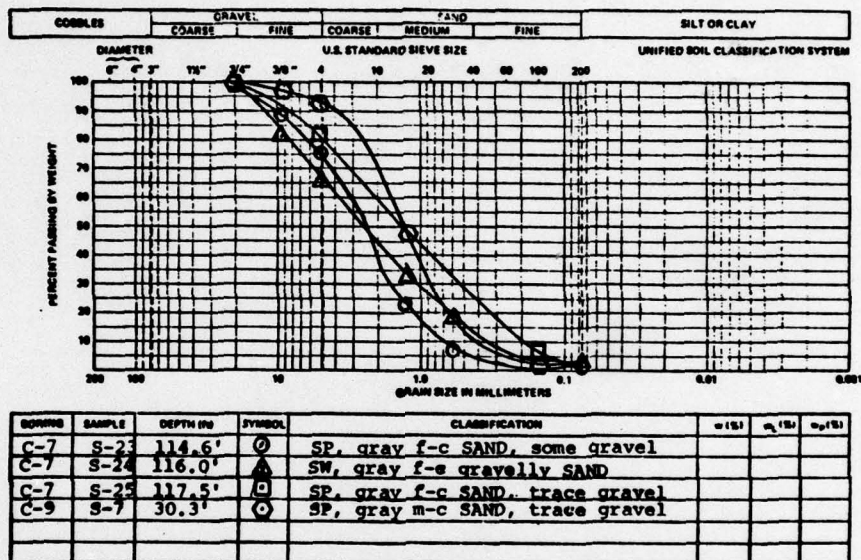


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Fig. A.10





## DRILLED-IN PILE TEST PROGRAM

### GRAIN-SIZE DISTRIBUTIONS OF C SERIES BORINGS

FOUNDATION INVESTIGATION AND TEST PROGRAM

EXISTING LOCKS AND DAM No. 26

ST LOUIS DISTRICT, CORPS OF ENGINEERS.

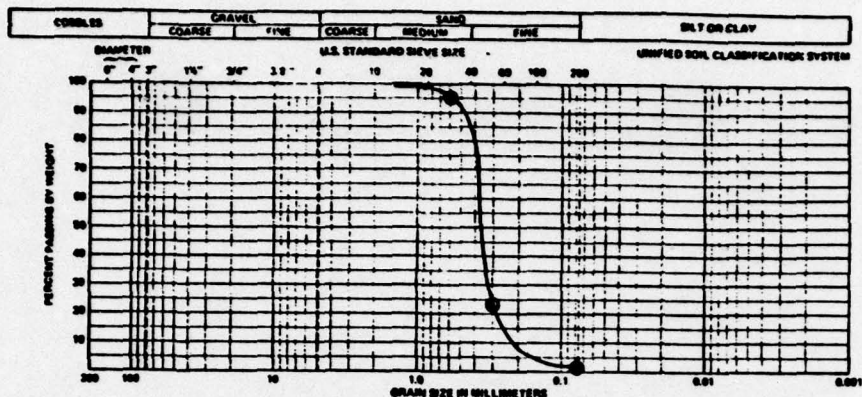
DACW43-78-C-0005



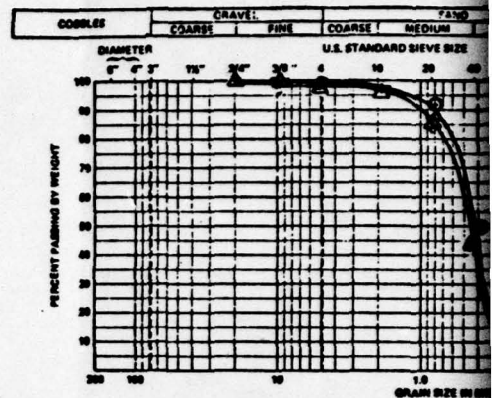
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V7C825 Phase IV

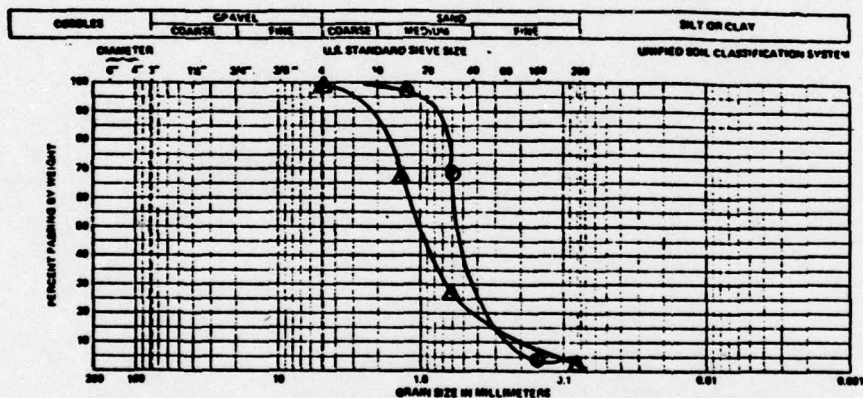
Fig. A.11



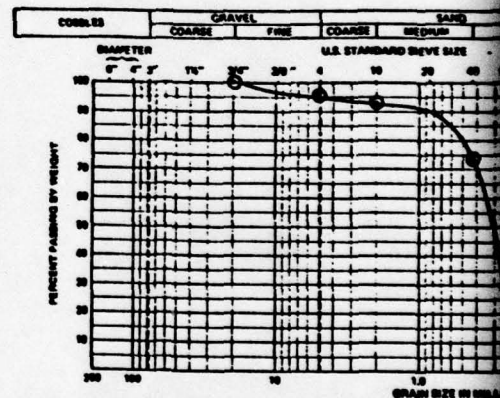
BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	w <sub>L</sub> (%)	w <sub>p</sub> (%)
D-1	S-5	24'	⊙	SP, gray f-m SAND, trace silt			



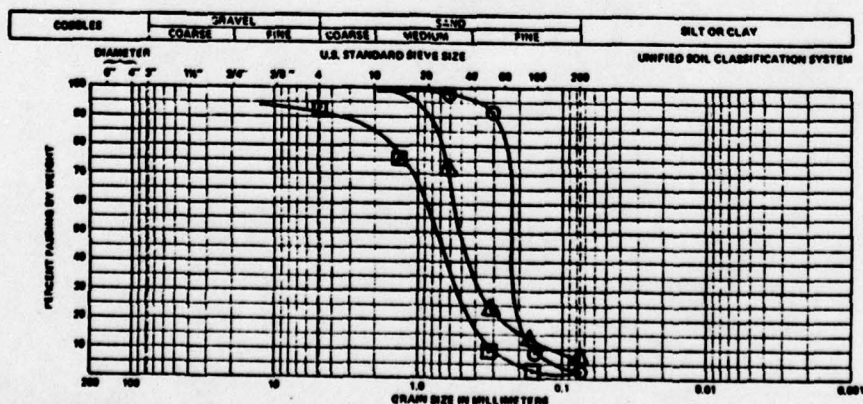
BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	w <sub>L</sub> (%)	w <sub>p</sub> (%)
D-1	OS-1	28.8'	⊙	SP, gray f-m SAND			
D-1	OS-1	29.4'	Δ	SP, gray f-m SAND			



BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	w <sub>L</sub> (%)	w <sub>p</sub> (%)
D-1	S-6	34'	⊙	SP, gray m-f SAND, trace silt			
D-1	S-7	44.5'	Δ	SP, gray c-f SAND, trace gravel			

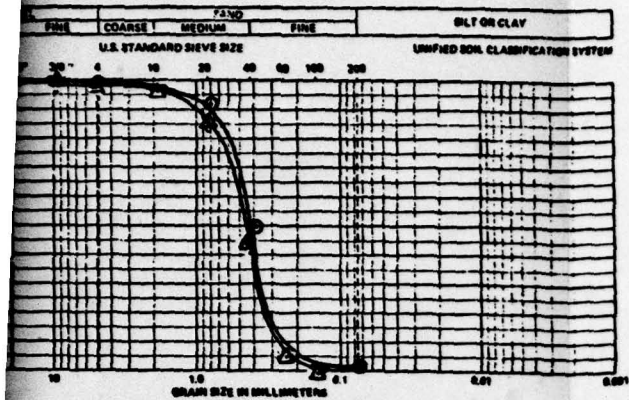


BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	w <sub>L</sub> (%)	w <sub>p</sub> (%)
D-1	OS-2	40.5'	⊙	SP, gray f-c SAND			

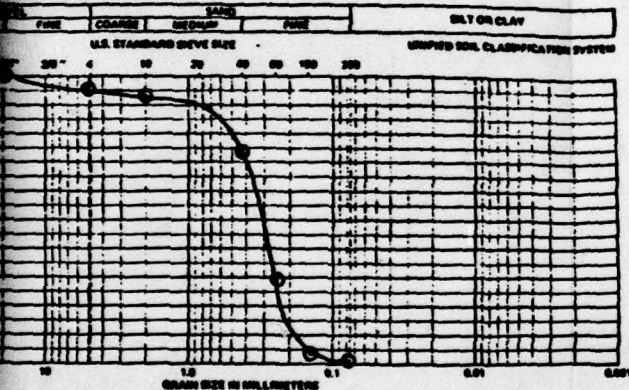


BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	w <sub>L</sub> (%)	w <sub>p</sub> (%)
D-1	S-8	54.5'	⊙	SP, gray f SAND, trace silt			
D-1	S-9	64.5'	Δ	SP-SH, gray m-f SAND, trace silt			
D-1	S-11	74.5'	□	SP, gray f-c SAND, trace gravel			





SYMBOL	CLASSIFICATION	$w$ (%)	$e$ (%)	$w_p$ (%)
⊙	SP, gray f-m SAND, trace silt	⊙		
Δ	SP, gray f-m SAND, trace silt	⊙		



SYMBOL	CLASSIFICATION	$w$ (%)	$e$ (%)	$w_p$ (%)
⊙	SP, gray f-c SAND, trace gravel	⊙		

# DRILLED-IN PILE TEST PROGRAM

## GRAIN-SIZE DISTRIBUTIONS OF D SERIES BORINGS

FOUNDATION INVESTIGATION AND TEST PROGRAM

EXISTING LOCKS AND DAM No. 26

ST LOUIS DISTRICT, CORPS OF ENGINEERS.

DACW43-78-C-0008

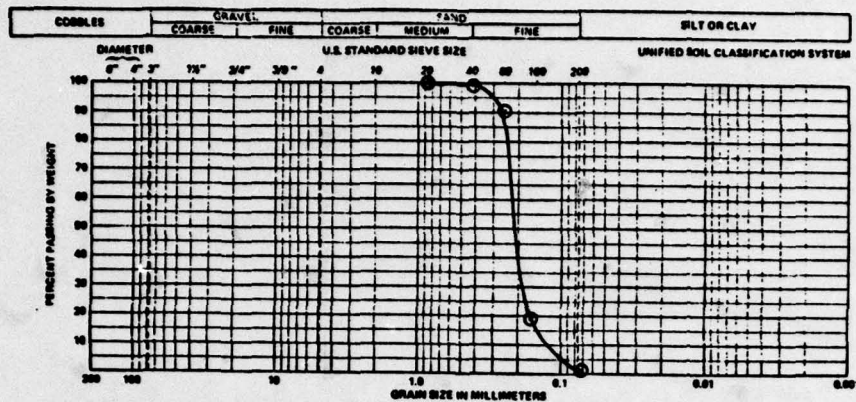


Woodward-Clyde Consultants

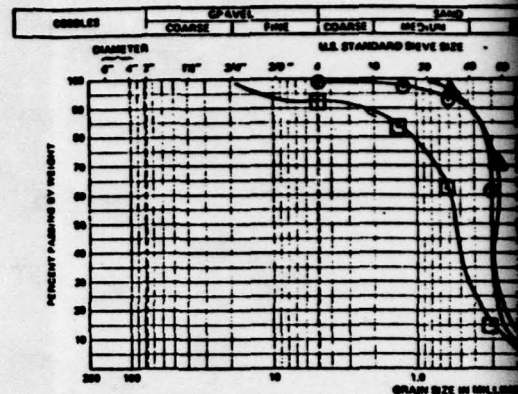
Fig. A.12

Y7C825 Phase IV

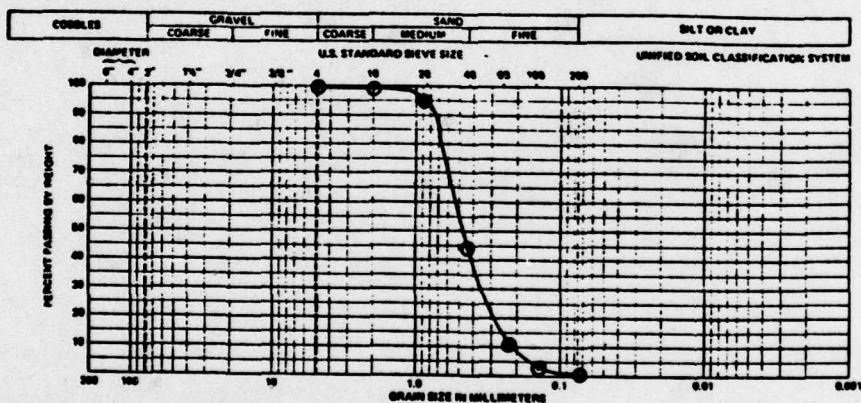
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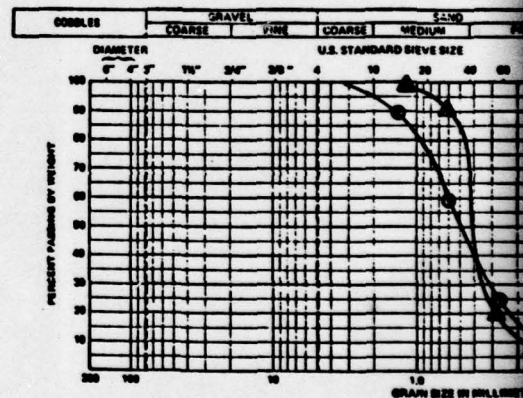
BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	e <sub>s</sub> (%)	ρ <sub>p</sub> (%)
D-2	OS-1	29'	⊙	SP, gray f SAND, trace silt	65		



BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	e <sub>s</sub> (%)	ρ <sub>p</sub> (%)
D-2	S-4	19'	⊙	SP, light brown f SAND, trace silt	65		
D-2	S-6	39.5'	⊙	SP, gray f SAND, trace silt	65		
D-2	S-7	49'	⊙	SP, gray m-f SAND, trace silt	65		

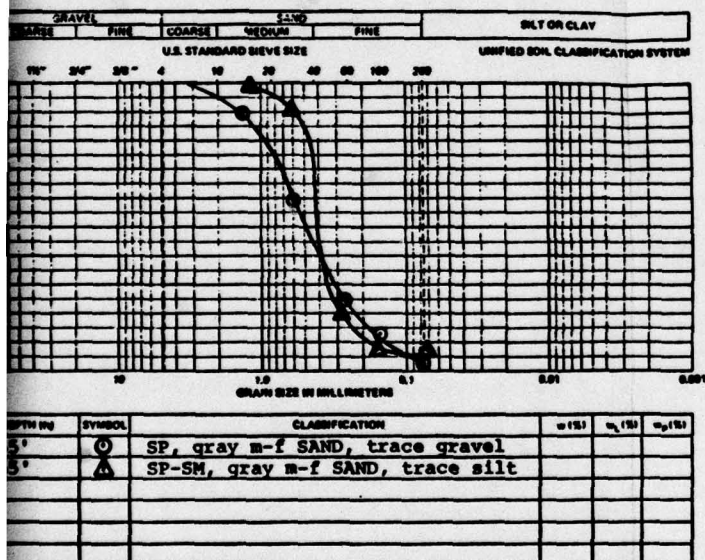
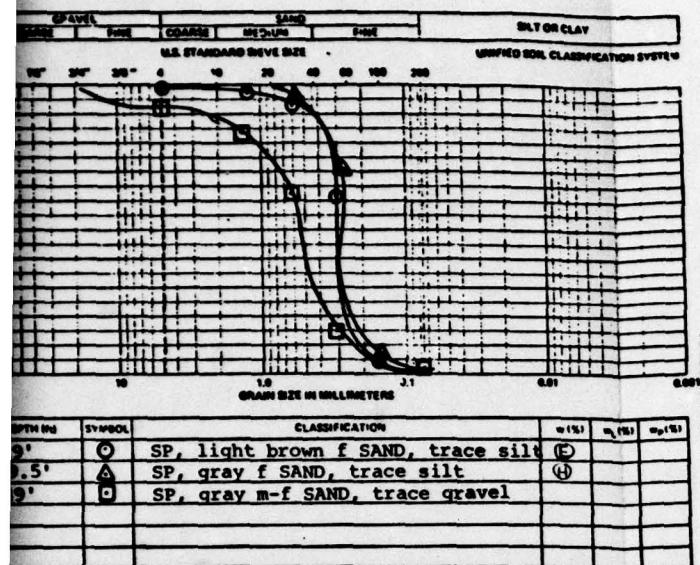


BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	e <sub>s</sub> (%)	ρ <sub>p</sub> (%)
D-2	OS-2	35.4'	⊙	SP, gray m-f SAND, trace silt	65		



BORING	SAMPLE	DEPTH (ft)	SYMBOL	CLASSIFICATION	w (%)	e <sub>s</sub> (%)	ρ <sub>p</sub> (%)
D-2	S-8	55'	⊙	SP, gray m-f SAND, trace silt	65		
D-2	S-9	65'	⊙	SP-SH, gray m-f SAND, trace silt	65		





# DRILLED-IN PILE TEST PROGRAM

## GRAIN-SIZE DISTRIBUTIONS OF D SERIES BORINGS

FOUNDATION INVESTIGATION AND TEST PROGRAM

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ST. LOUIS DISTRICT, CORPS OF ENGINEERS.

DACW43-78-C-0005

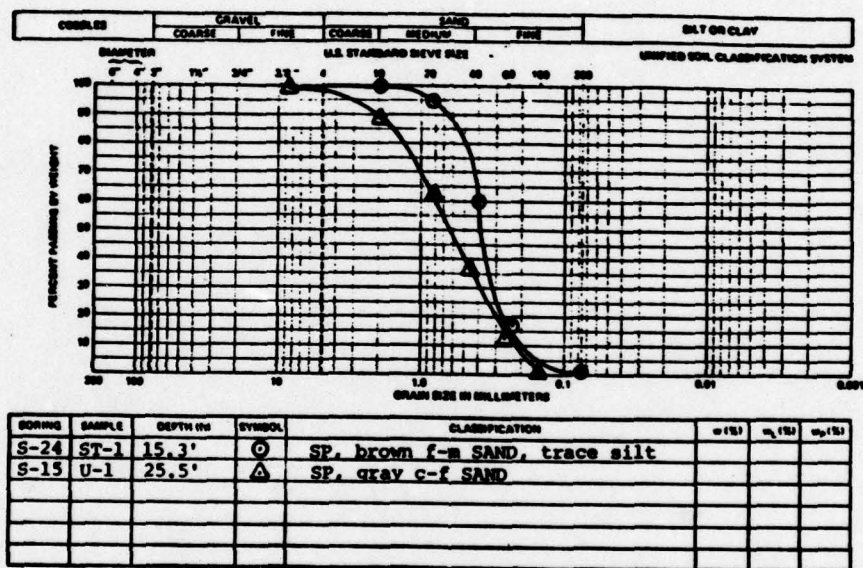


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Y7C825 Phase II

Fig. A.13

2



**DRILLED-IN PILE TEST PROGRAM**

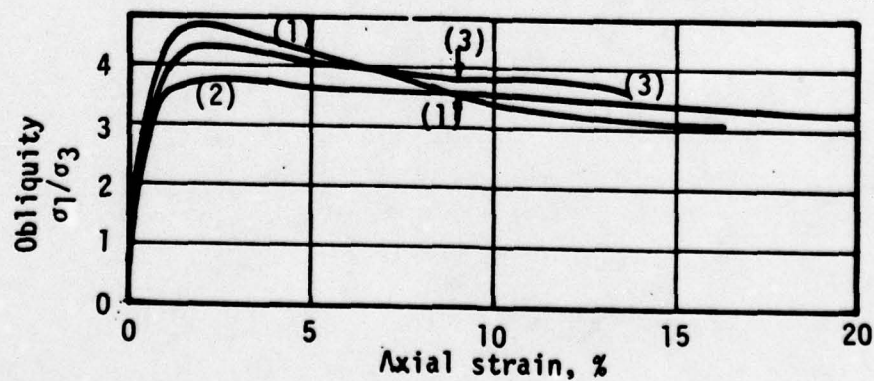
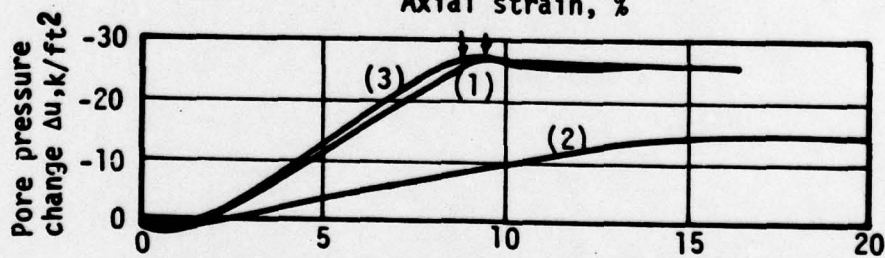
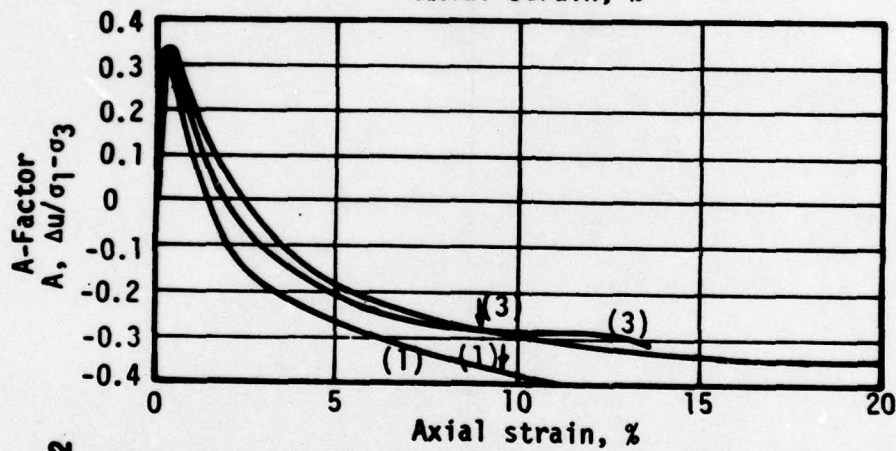
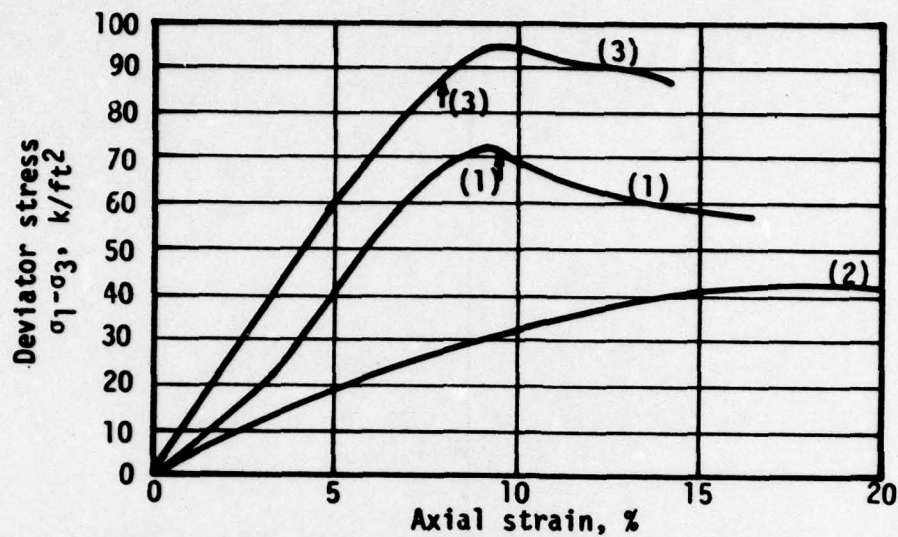
**GRAIN-SIZE DISTRIBUTIONS  
OF S SERIES BORINGS**

FOUNDATION INVESTIGATION AND TEST PROGRAM  
EXISTING LOCKS AND DAM No. 26  
ST LOUIS DISTRICT, CORPS OF ENGINEERS.  
DACW43-78-C-0008

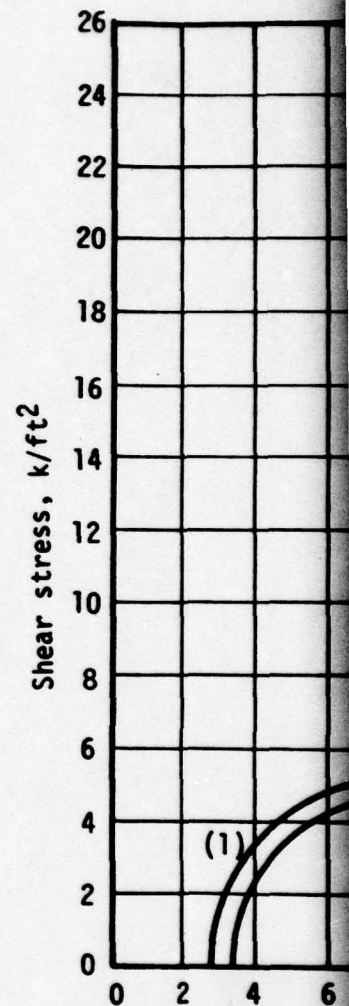
**Woodward-Clyde Consultants**  
Y7C825 Phase II

**Fig. A.14**



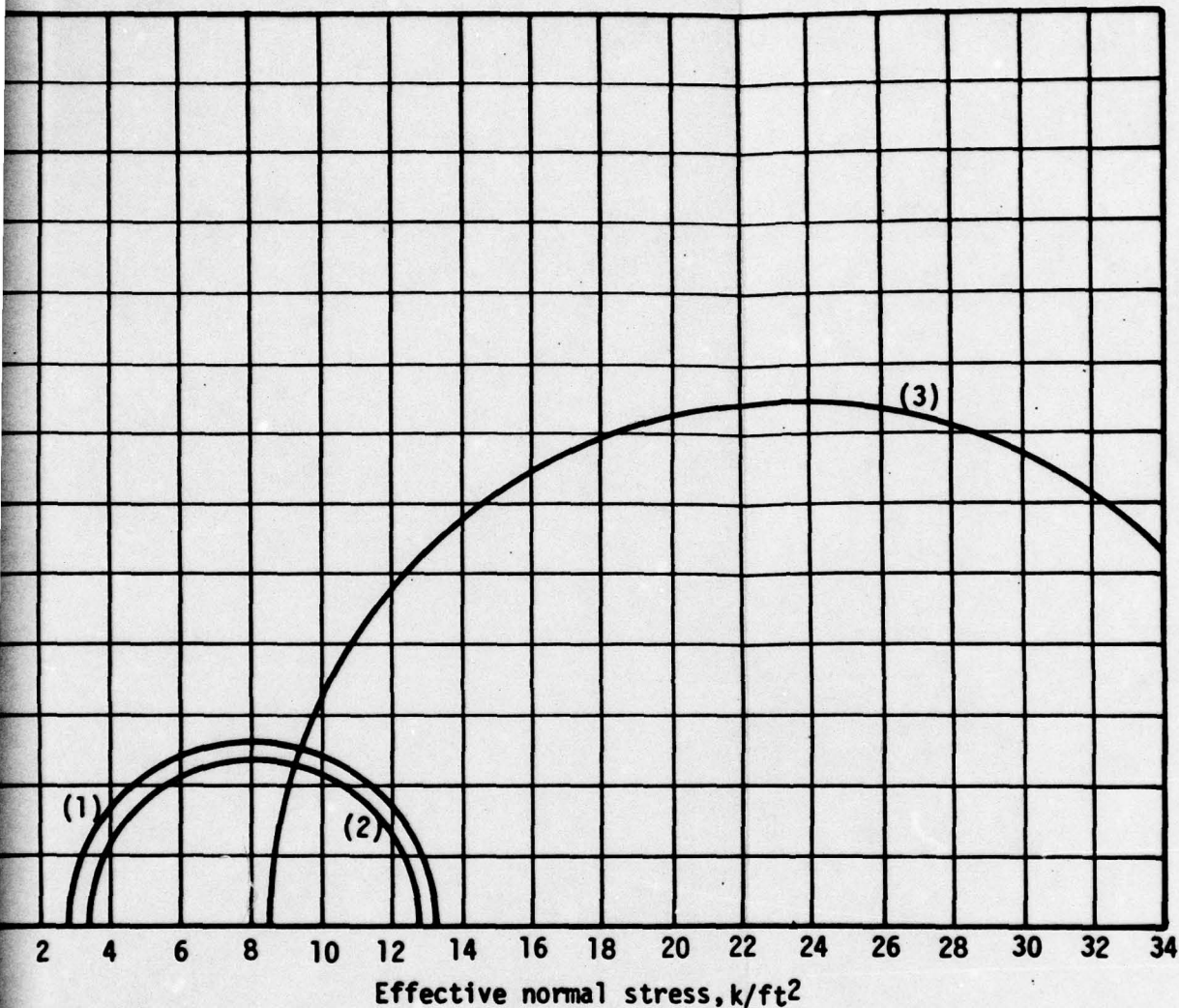


↑ Cavitation most likely occurred




- Notes:**
1.  $\sigma_{3c} = 1.70 \text{ k/f}$   
 $D_r = 66\% \text{ aft}$
  2.  $\sigma_{3c} = 3.46 \text{ k/f}$   
 $D_r = 51\% \text{ aft}$
  3.  $\sigma_{3c} = 6.98 \text{ k/f}$   
 $D_r = 72\% \text{ aft}$

For conditions of peak obliquity ( $\sigma_1/\sigma_3$ )

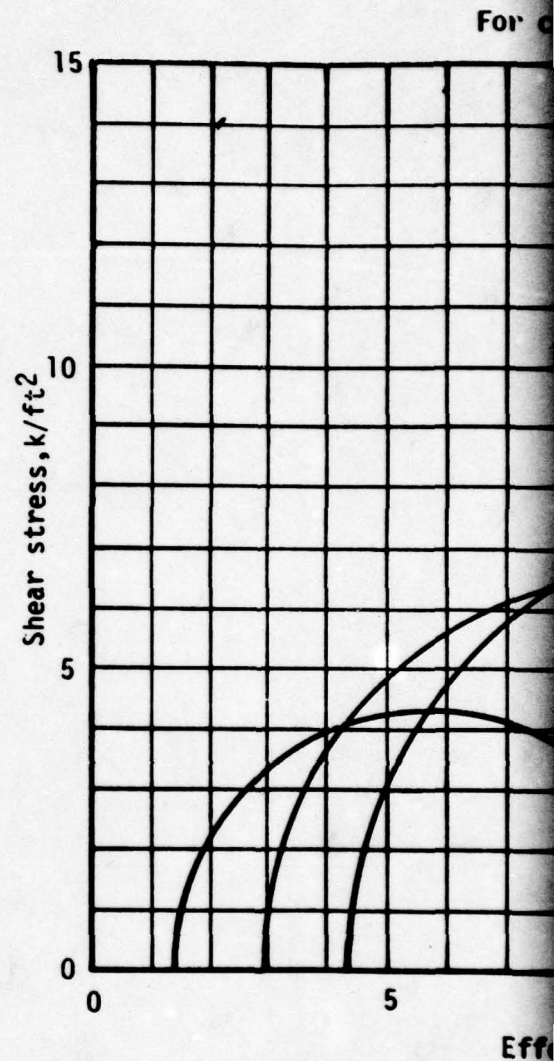
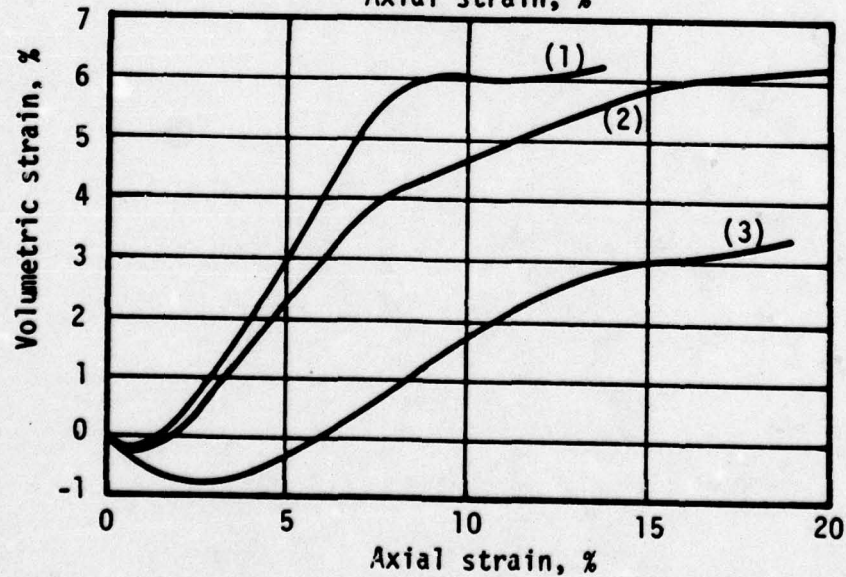
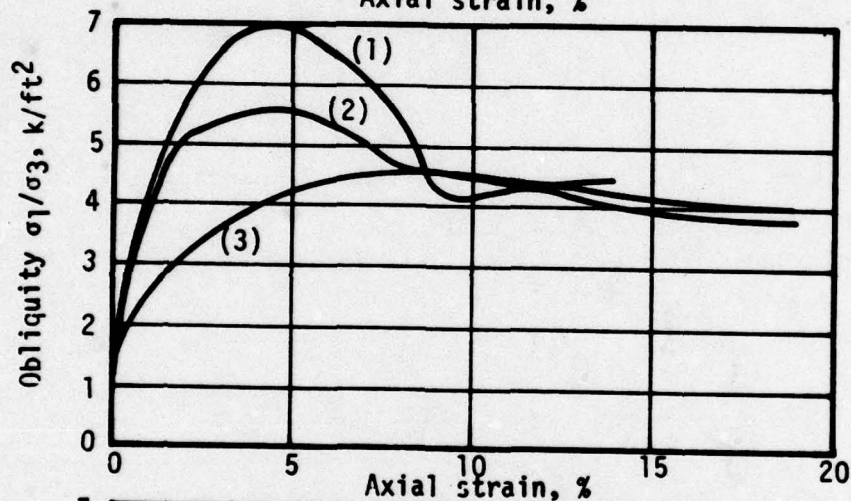
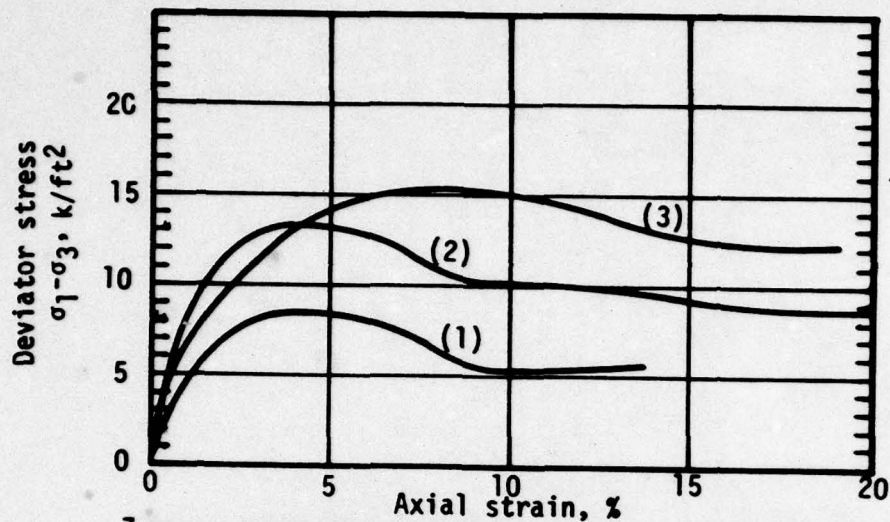


$\sigma_{3c} = 1.70 \text{ k/ft}^2$ ; boring D-1 @ 29.4 ft  
 $D_r = 66\%$  after consolidation  
 $\sigma_{3c} = 3.46 \text{ k/ft}^2$ ; boring D-1 @ 23.8 ft  
 $D_r = 51\%$  after consolidation  
 $\sigma_{3c} = 6.98 \text{ k/ft}^2$ ; boring D-1 @ 40.5 ft  
 $D_r = 72\%$  after consolidation

4. Tests performed on SP sand
5. Specimens: 2.9-in.-dia. by 6-in. height
6. Strain rate about 3%/hr

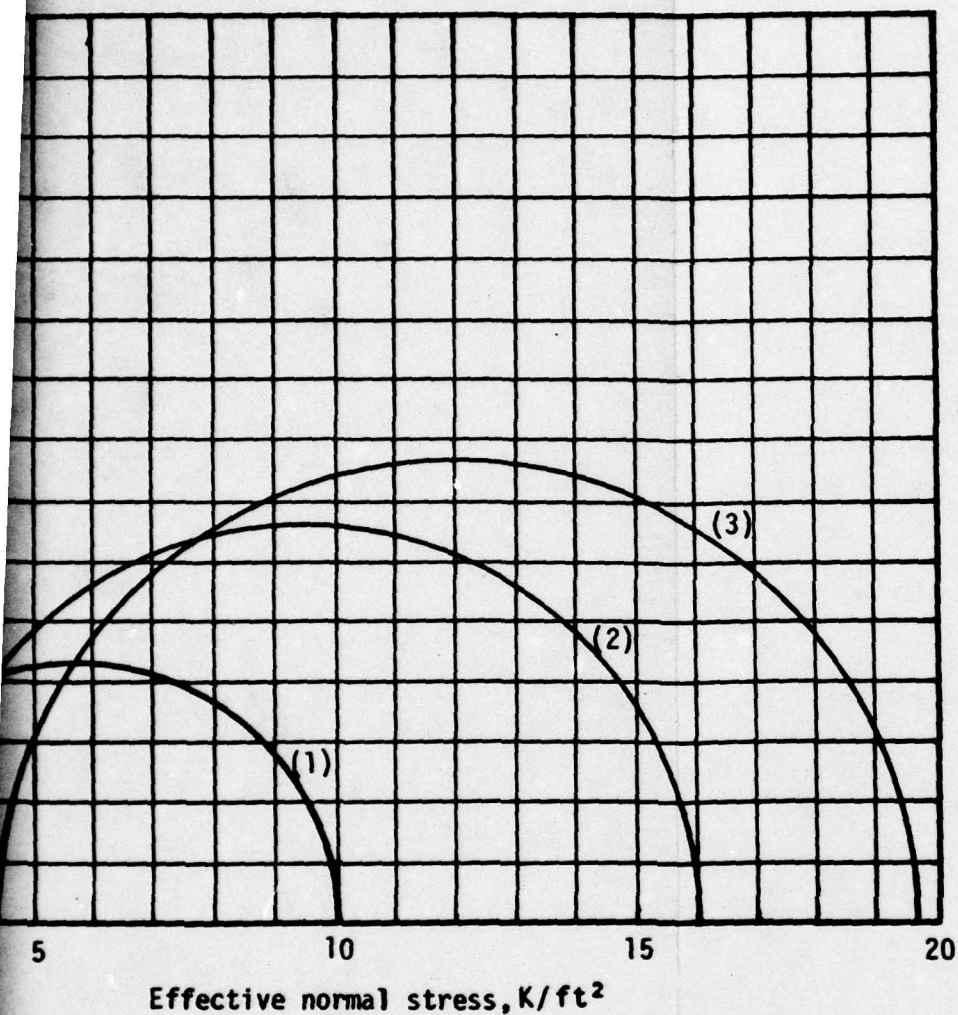
<b>DRILLED-IN PILE TEST PROGRAM</b>	
<b>RESULTS OF <math>\bar{C}ID</math> TRIAXIAL COMPRESSION TESTS UNDISTURBED SAMPLES</b>	
<small>FOUNDATION INVESTIGATION AND TEST PROGRAM EXISTING LOCKS AND DAM NO. 26 ST. LOUIS DISTRICT, CORPS OF ENGINEERS. DACW43-76-C-0005</small>	
 Woodward-Clyde Consultants <small>V7C825 Phase II</small>	<b>Fig. A.15</b>





- Notes:
1.  $\sigma_c = 1.43 \text{ k/ft}^2$ ; boring D-  
 $D_r = 79\%$  after consolidation
  2.  $\sigma_c = 2.89 \text{ k/ft}^2$ ; boring D-  
 $D_r = 77\%$  after consolidation

For conditions of peak deviator stress ( $\sigma_1 - \sigma_3$ )



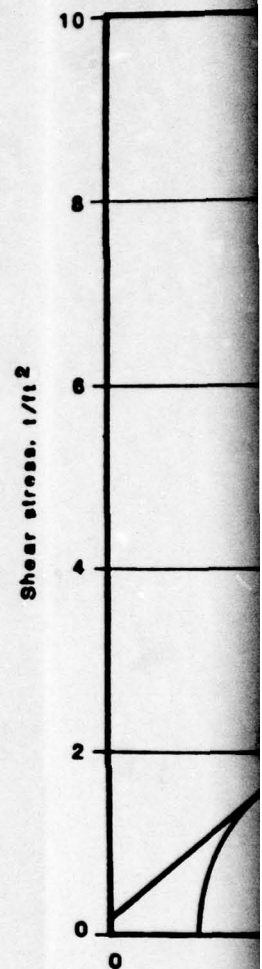
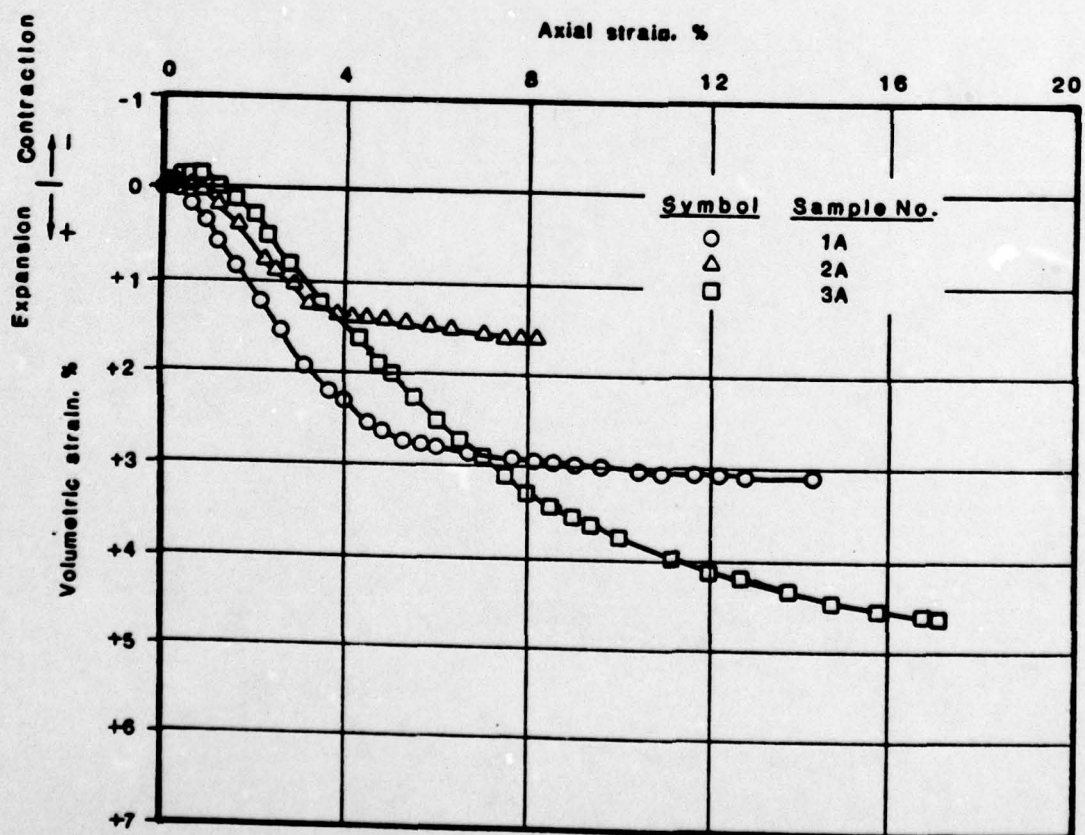
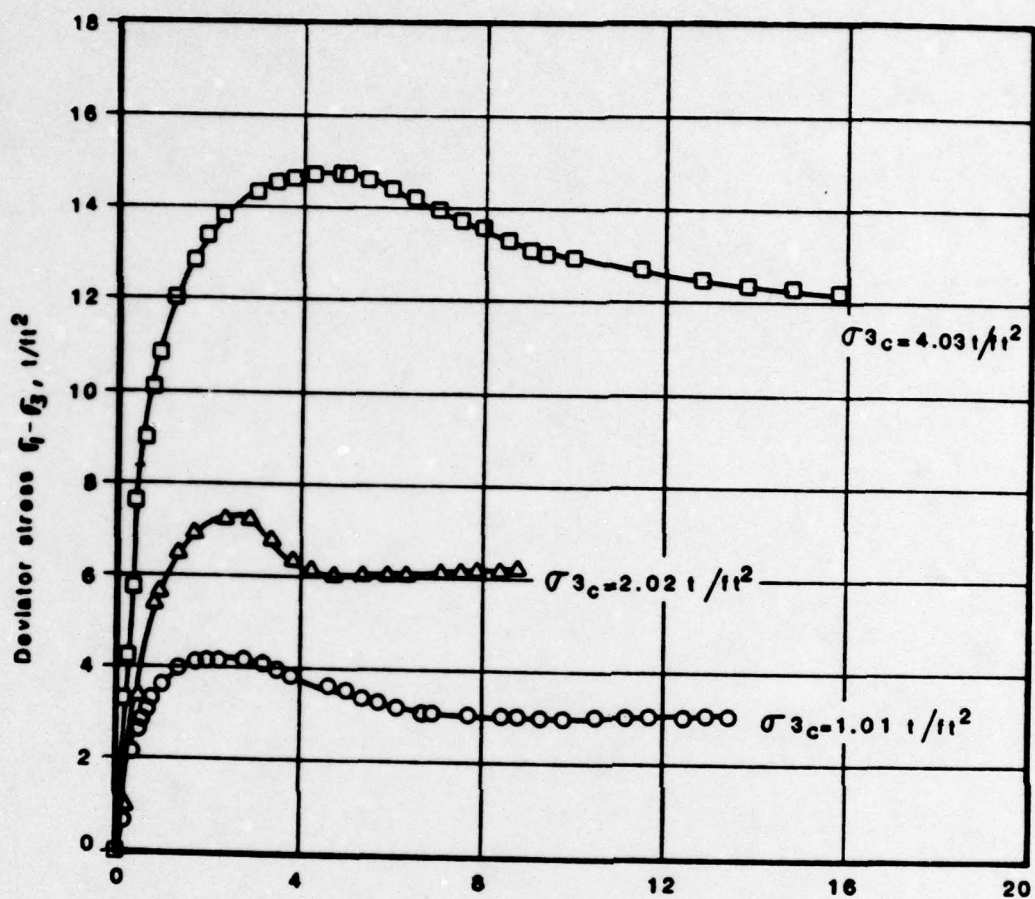
1.  $\sigma_c = 4.33 \text{ k/ft}^2$ ; boring D-2 @ 29.7 ft  
after consolidation  
2.  $\sigma_c = 4.33 \text{ k/ft}^2$ ; boring D-2 @ 29 ft  
after consolidation

3.  $\sigma_c = 4.33 \text{ k/ft}^2$ ; boring D-2 @ 35.4 ft  
 $D_r = 90\%$  after consolidation
4. Tests performed on SP sand
5. Specimens 2.9-in.-dia. by 6-in. height
6. Strain rate about 3%/hr

<b>DRILLED-IN PILE TEST PROGRAM</b>	
<b>RESULTS OF <math>\bar{C}_{ID}</math> TRIAXIAL COMPRESSION TESTS UNDISTURBED SAMPLES</b>	
<small>FOUNDATION INVESTIGATION AND TEST PROGRAM EXISTING LOCKS AND DAM No. 26 ST LOUIS DISTRICT, CORPS OF ENGINEERS. DACW43-76-C-0000</small>	
 Woodward-Clyde Consultants <small>Y7C020 Phase III</small>	<b>Fig. A.16</b>

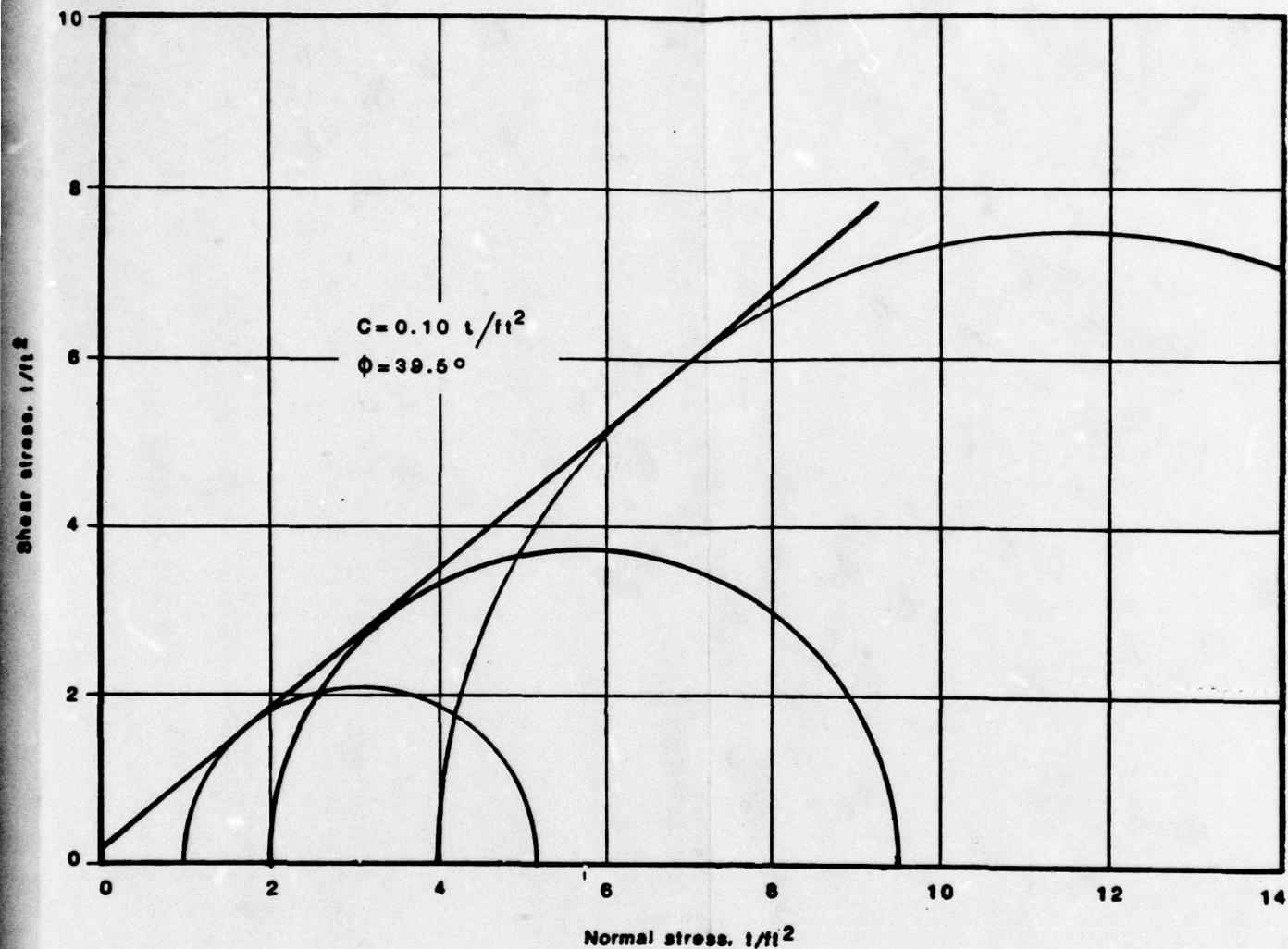
2






**Notes:**

- 1 Axial stress
  - 2 Sand sample
  - 3 Sand sample
- $D_r = 70\%$   
and 6.0-



**Notes:**

- 1 Axial strain rate - 0.5 %/min
- 2 Sand samples were reconstituted at  $D_r = 70\%$  ( $\bar{\sigma}_d = 108 \text{ } lb/ft^3$ )
- 3 Sand samples were 2.8- in.-dia and 6.6- in.-high

<b>DRILLED-IN PILE TEST PROGRAM</b>	
<b>RESULTS OF <math>\bar{C}\bar{I}\bar{D}</math> TRIAXIAL COMPRESSION TESTS RECONSTITUTED SAMPLES</b>	
FOUNDATION INVESTIGATION AND TEST PROGRAM EXISTING LOCKS AND DAM No. 26 ST LOUIS DISTRICT, CORPS OF ENGINEERS. DACW43-78-C-0005	
 Woodward-Clyde Consultants <small>V7C026 Phase III</small>	<b>Fig. A.17</b>



**PHASE IV REPORT**

**VOLUME IVA**

**RESULTS AND INTERPRETATION OF  
DRILLED-IN PILE TEST PROGRAM**

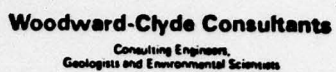
**APPENDIX B**

**EFFECTS OF DRILLING - GROUND MOVEMENTS**

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Table B.1	SUMMARY OF SUBSURFACE MONUMENT MEASUREMENT DATA
Table B.2	SUMMARY OF BORROS SETTLEMENT GAGE MEASUREMENT DATA
Table B.3 through Table B.10	SUMMARY OF SONDEX MEASUREMENT DATA
Figure B.1 through Figure B.7	RESULTS OF INCLINOMETER MEASUREMENTS





## Appendix B

Table B.1 Summary of Surface Monument Measurement Data

Date	Surface Ref. Pt. Mining Tip	R1	R2	R3	R4	R5
1978 10/24.25	422	421.358	421.468	421.428	421.263	421.156
12/21	389	421.324	421.431	421.395	421.231	421.110
12/28	356	421.321	421.424	421.392	421.227	421.104
12/30	321			421.390	421.224	
1979 1/4	305		421.424	421.390	421.223	
1/15	290		421.415	421.381		
1/16	290	421.312			421.217	421.090
1/19	373				421.214	421.087
1/20	356				421.214	421.087
1/21	339			421.379	421.212	421.084
1/23	321			421.379	421.211	
1/26	304	421.308	421.413	421.380	421.210	421.082
3/7	290		421.409			
Note: Elevations in ft.						

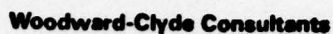
## DATA SHEET

## Appendix B

Table B.2 Summary of Borras Settlement Gage Measurement Data

[illegible]





**Consulting Engineers,  
Geologists and Environmental Scientists**

## Appendix B

Table B.3. Summary of Sondex Measurement Data (DP-3DI)

[illegible]





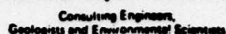
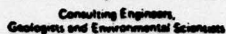


Table B.5 Summary of Sondex Measurement Data (DP-303)

[illegible]

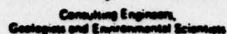


## Appendix B

Table B.6. Summary of Sondex Measurement Data (DP-304)

Date	21 Dec. 78	12 Jan. 79	2 Feb. 79
	420.10	420.08	420.03
	417.58	417.58	417.52
	415.14	415.15	415.08
	412.57	412.57	412.51
	410.11	410.10	410.05
	407.71	407.72	407.68
	405.22	405.22	405.17
	402.69	402.70	402.67
	400.05	400.05	400.00
	397.69	397.70	397.66
	395.23	395.25	395.18
	392.78	392.78	392.74
	390.02	390.09	389.98
	387.69	387.71	387.65
	385.20	385.22	385.18
	382.80	382.82	382.76
	380.25	380.26	380.22
	377.74	377.75	377.70
	375.29	375.30	375.25
	372.77	372.78	372.74
	367.74	367.75	367.70
	362.80	362.82	362.78
	357.72	357.75	357.70
	352.79	352.80	352.76
	347.85	347.87	347.82
	337.66		337.60
	327.62		327.62
	317.72		317.66
	307.65		307.61

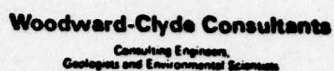




## Appendix B

Table B.7 Summary of Sondex Measurement Data - (DP-305)

[illegible]

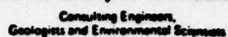


## Appendix B

Table B.8 Summary of Sondex Measurement Data. (DP-306)

[illegible]

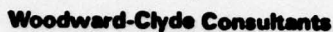




## Appendix B

Table B.9 Summary of Sondex Measurement Data. (DP-307)

Date	21 Dec. 78	12 Jan. 79	21 Feb. 79
	422.32	422.34	422.34
	418.48	418.46	418.46
	408.55	408.53	408.53
	398.51	398.50	398.51
	393.61	393.60	393.61
	388.57	388.57	388.58
	386.11	386.11	386.12
	383.66	383.66	383.66
	381.16	381.15	381.16
	378.64	378.65	378.66
	376.14	376.13	376.14
	373.69	373.69	373.71
	371.16	371.16	371.17
	368.68	368.67	368.69
	366.13	366.13	366.13
	363.68	363.67	363.69
	361.13	361.12	361.15
	358.64	358.64	358.65
	356.10	356.10	356.12
	353.80	353.79	353.81
	351.13	351.13	351.15
	348.64	348.64	348.65
	346.11	346.11	346.13
	343.19	343.20	343.22
	340.71	340.71	340.74
	338.13	338.14	338.16
	333.20	333.21	332.23
	328.20	328.21	328.23
	323.14	323.15	323.17
	318.13	318.16	318.18
	313.14	313.16	313.18
	303.20	303.22	303.24



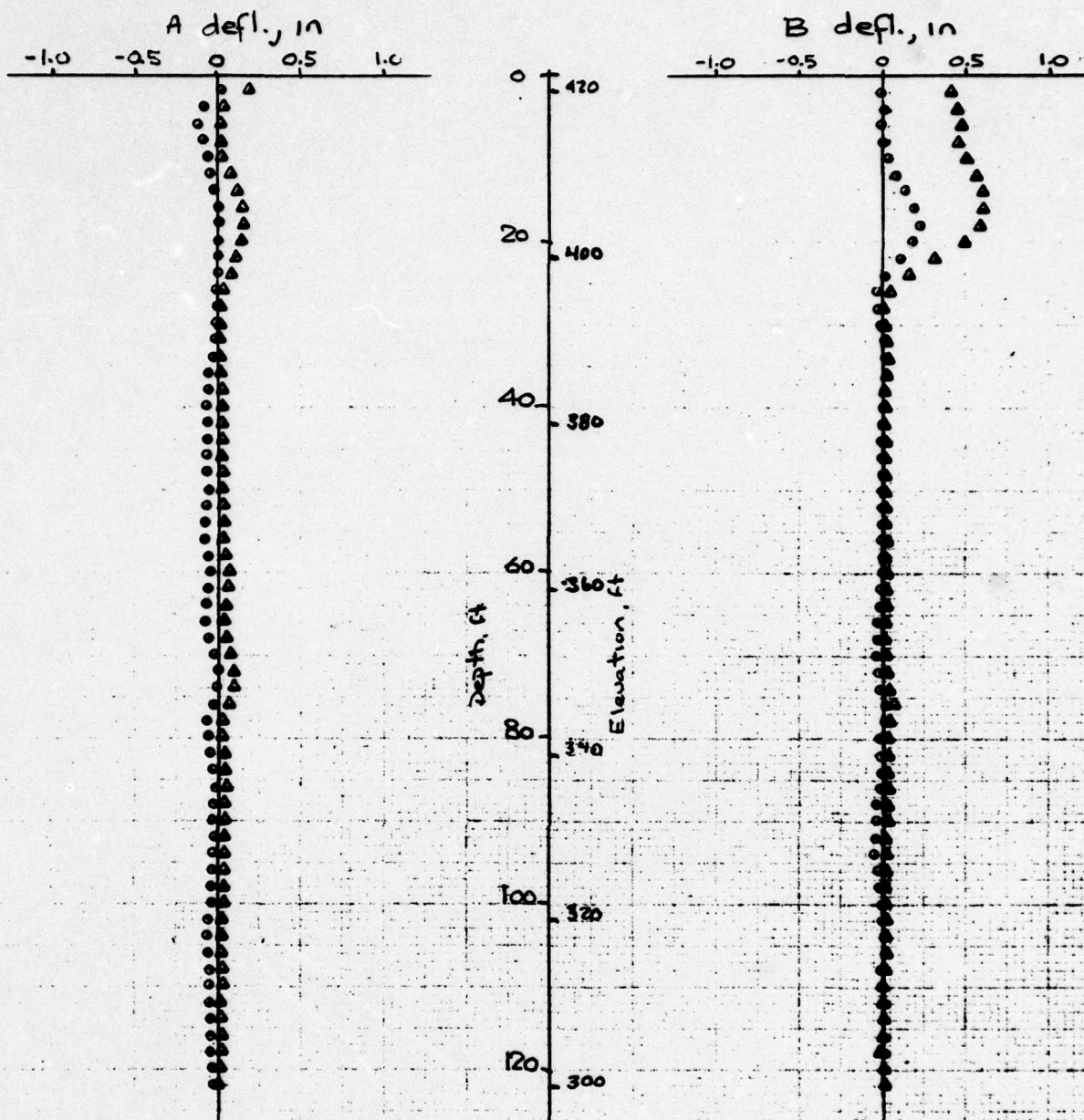
**Consulting Engineers,  
Geologists and Environmental Scientists**

## Appendix B

Table B.10 Summary of Sondex Measurement Data (DP-308)

[illegible]





CASING No DP3D1

Date 2/6/79 •

Date 1/12/79 •



WCC Y7C835 Jh IX April 24, 1979 MH

# DRILLED-IN FILE TEST PROGRAM

## RESULTS OF INCLINOMETER DP-3D1 MEASUREMENTS 12 JAN 1979 AND 6 FEB 1979

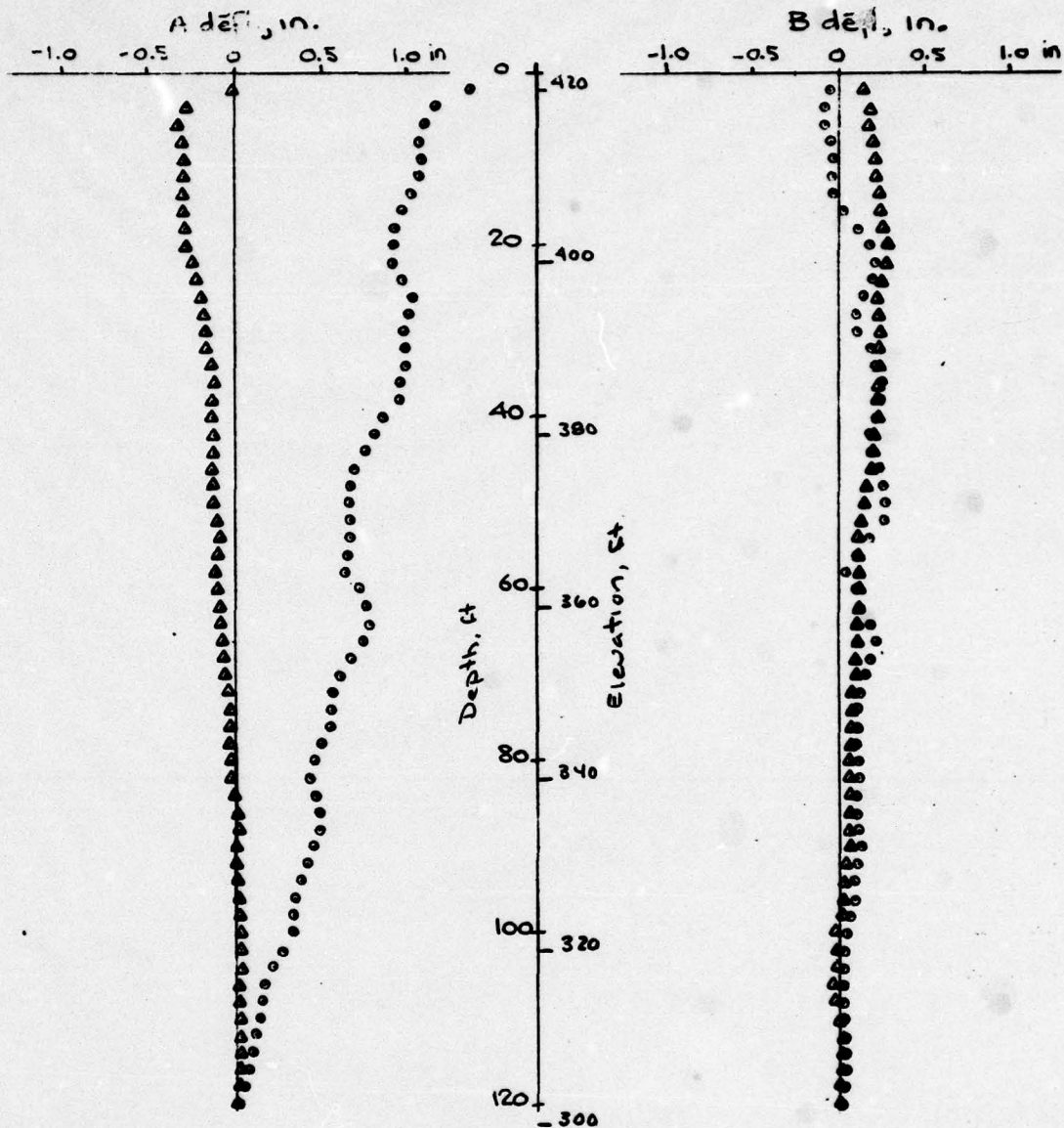
FOUNDATION INVESTIGATION AND TEST PROGRAM  
EXISTING LOCKS AND DAM No. 20  
ST LOUIS DISTRICT, CORPS OF ENGINEERS.  
DACW43-78-C-0008



Woodward-Clyde Consultants

Y7C835 Photo IX

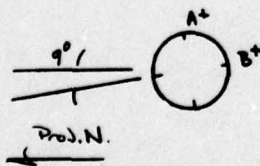
Fig. B.1



CASING No DP3D2

DATE 2/21/79 ○

DATE 1/12/79 △



UCC Y7C826 PW11. April 1979 M1

# DRILLED-IN PILE TEST PROGRAM

## RESULTS OF INCLINOMETER DP-3D2 MEASUREMENTS 12 JAN 1979 AND 21 FEB 1979

FOUNDATION INVESTIGATION AND TEST PROGRAM

EXISTING LOCKS AND DAM No. 26

ST LOUIS DISTRICT, CORPS OF ENGINEERS.

DACW43-78-C-0005

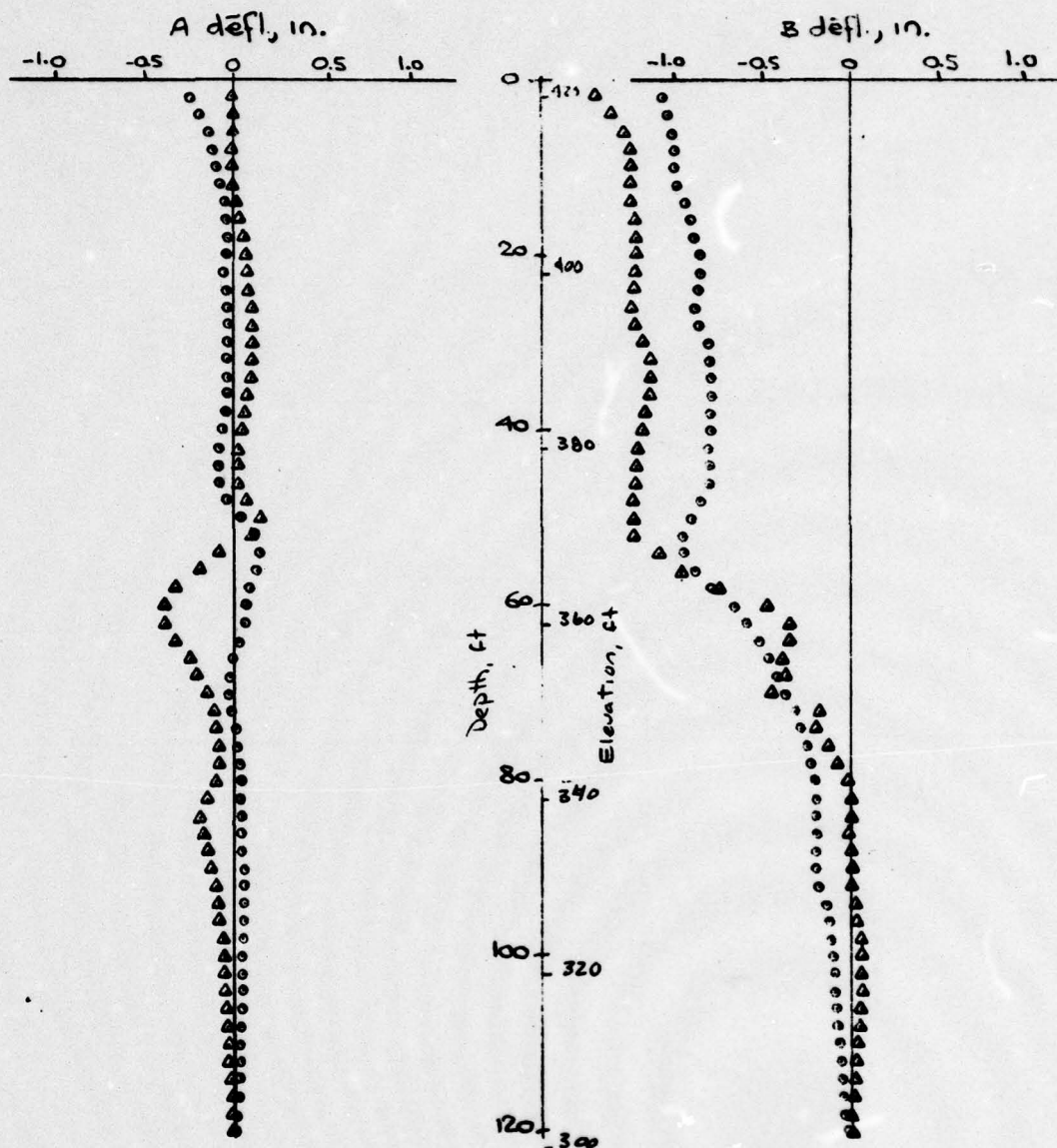


Woodward-Clyde Consultants

Y7C826 Phase III

Fig. B.2

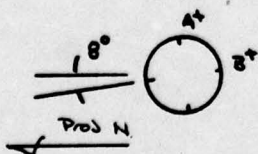




CASING NO DP3D3

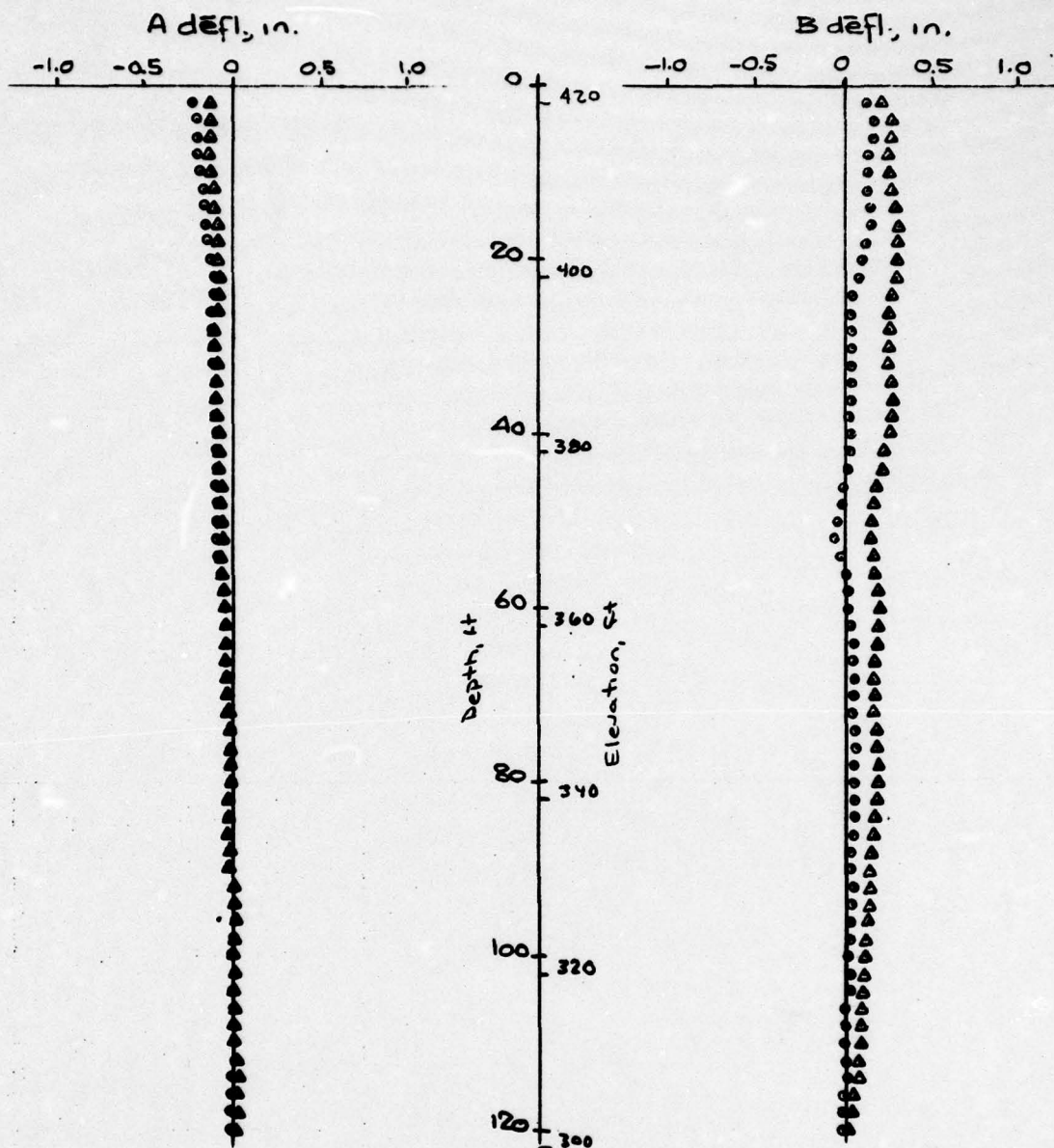
DATE 2/2/1979 ○

DATE 1/11/1979 △



WCC Y7C825 Ph II April 24 1979 MH

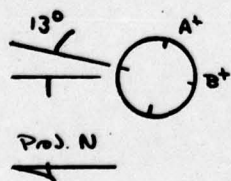
<b>DRILLED-IN FILE TEST PROGRAM</b>	
<b>RESULTS OF INCLINOMETER DP-3D3 MEASUREMENTS 11 JAN 1979 AND 2 FEB 1979</b>	
FOUNDATION INVESTIGATION AND TEST PROGRAM	
EXISTING LOCKS AND DAM No. 26	
ST LOUIS DISTRICT, CORPS OF ENGINEERS.	
DACW43-78-C-0005	
Woodward-Clyde Consultants Y7C825 Phase II	<b>Fig B.3</b>



CASING No DP3D5

DATE 2/6/79 ○

DATE 1/9/79 △



WCC Y7C825 Ph II April 26 1979 MH

# DRILLED-IN PILE TEST PROGRAM

## RESULTS OF INCLINOMETER DP-3D5 MEASUREMENTS 9 JAN 1979 AND 6 FEB 1979

FOUNDATION INVESTIGATION AND TEST PROGRAM

EXISTING LOCKS AND DAM No. 26

ST LOUIS DISTRICT, CORPS OF ENGINEERS.

DACW43-78-C-0008

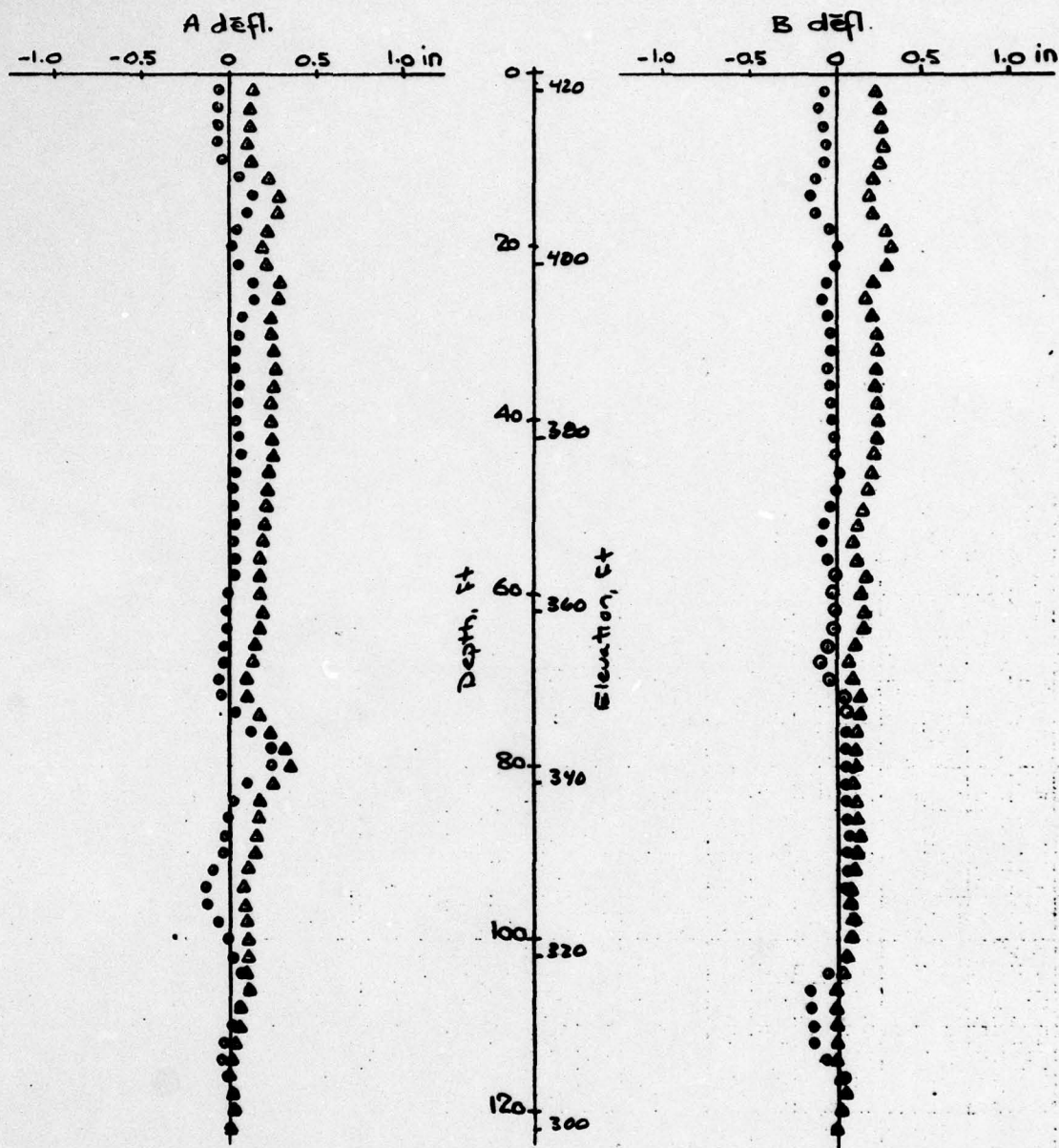


Woodward-Clyde Consultants

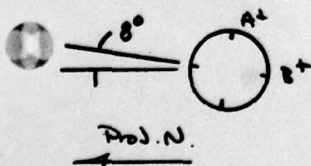
Y7C825 Phase II

Fig. B.4




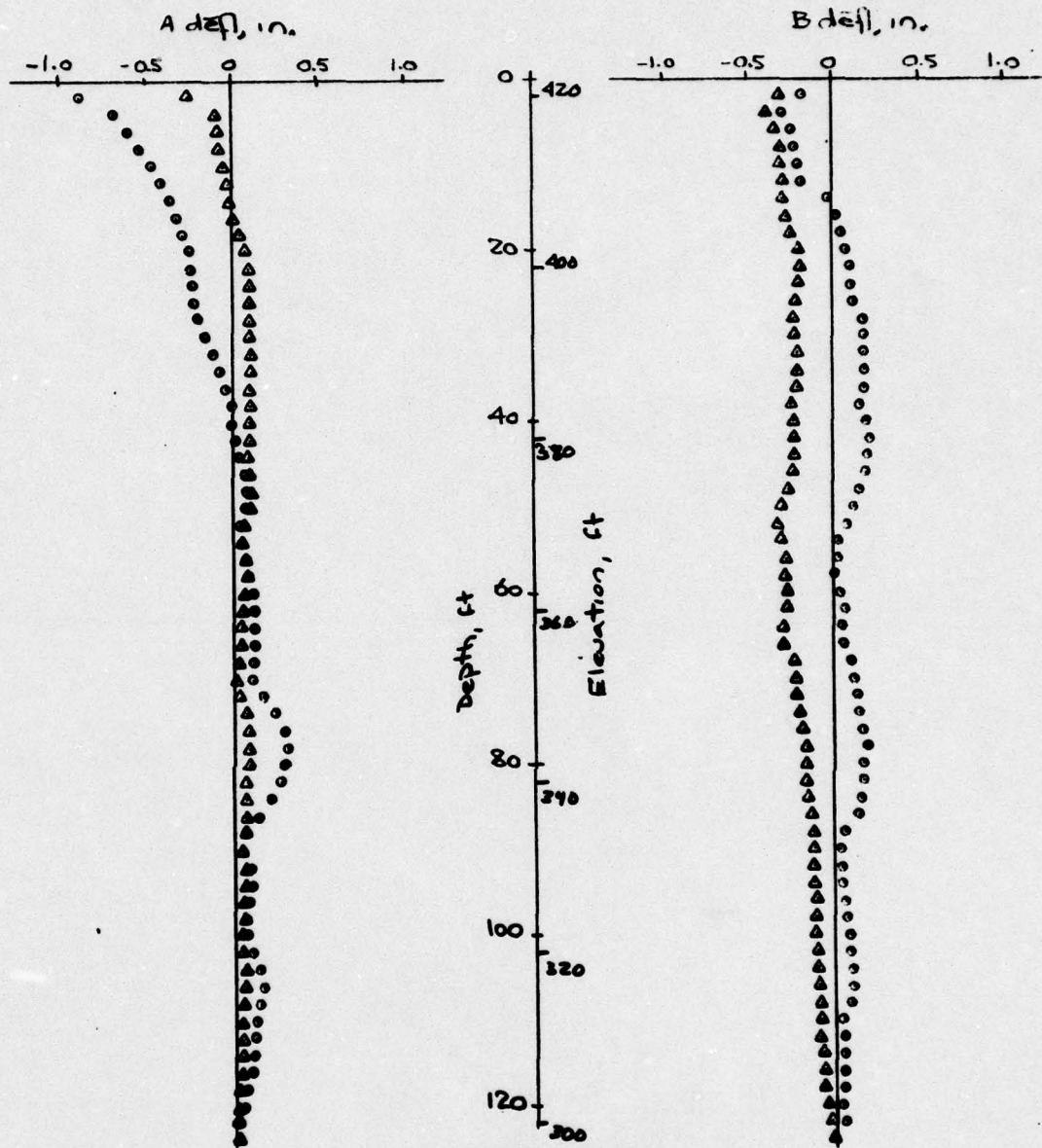


CASING No DP3D6  
 DATE 2/21/1979 ◊  
 DATE 1/11/1979 Δ



WCC Y7C825 PH II April 26 1979, MH

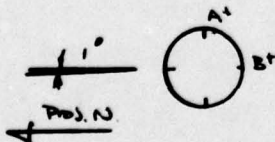
<b>DRILLED-IN PILE TEST PROGRAM</b>	
<b>RESULTS OF INCLINOMETER          DP-3D6 MEASUREMENTS          11 JAN 1979 AND 21 FEB 1979</b>	
FOUNDATION INVESTIGATION AND TEST PROGRAM EXISTING LOCKS AND DAM No. 26 ST LOUIS DISTRICT, CORPS OF ENGINEERS. DACW43-78-C-0000	
 Woodward-Clyde Consultants Y7C825 Phase II	<b>Fig. B.5</b>




CASING No DP3D7

DATE 2/22/79 °

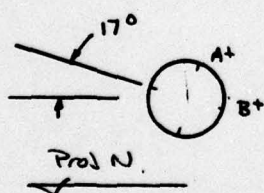
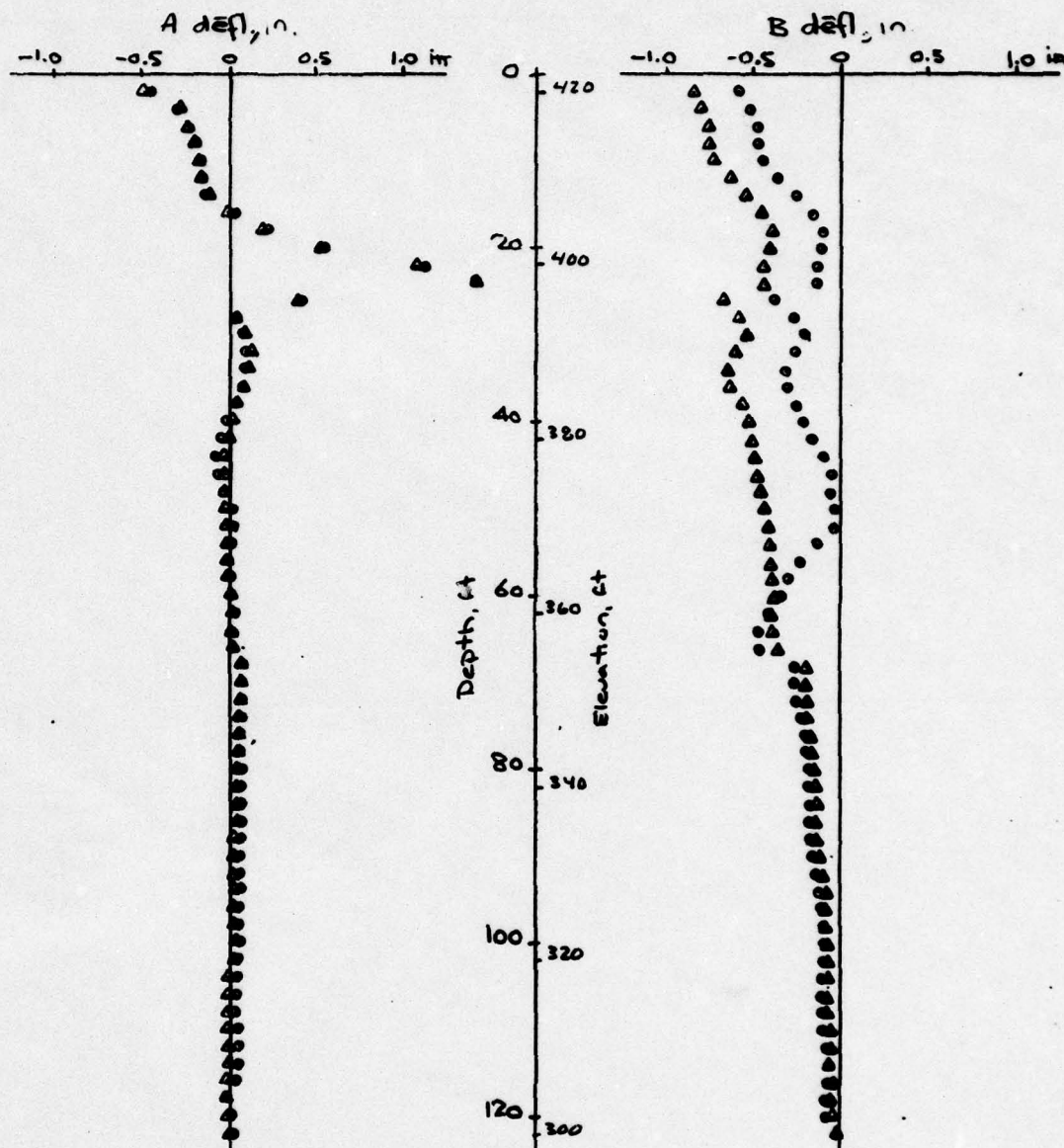
DATE 1/11/79 Δ



WCC Y7C825 Ph II April 26.1979

<p>DRILLED-IN PILE TEST PROGRAM</p> <p>RESULTS OF INCLINOMETER DP-3D7 MEASUREMENTS 11 JAN 1979 AND 22 FEB 1979</p>	
<p>FOUNDATION INVESTIGATION AND TEST PROGRAM EXISTING LOCKS AND DAM No. 26 ST LOUIS DISTRICT, CORPS OF ENGINEERS. DACW43-78-C-0005</p>	
<p> Woodward-Clyde Consultants Y7C825 Phase II</p>	<p>Fig. B.6</p>






CASING NO DP3DB

DATE 2/2/1979 0

DATE 1/11/1979 4

WCC Y7C825 Ph IV April 26, 1979 NH

<b>DRILLED-IN PILE TEST PROGRAM</b>	
<b>RESULTS OF INCLINOMETER DP-3DB MEASUREMENTS 11 JAN 1979 AND 2 FEB 1979</b>	
FOUNDATION INVESTIGATION AND TEST PROGRAM EXISTING LOCKS AND DAM NO. 20 ST LOUIS DISTRICT, CORPS OF ENGINEERS. SACW43-76-C-0005	
 <b>Woodward-Clyde Consultants</b> Y7C825 Phase II	<b>Fig. B.7</b>

**PHASE IV REPORT**

**VOLUME IVA**

**RESULTS AND INTERPRETATION OF  
DRILLED-IN PILE TEST PROGRAM**

**APPENDIX C**

**EFFECTS OF DRILLING  
CHANGE IN SOIL PROPERTIES**



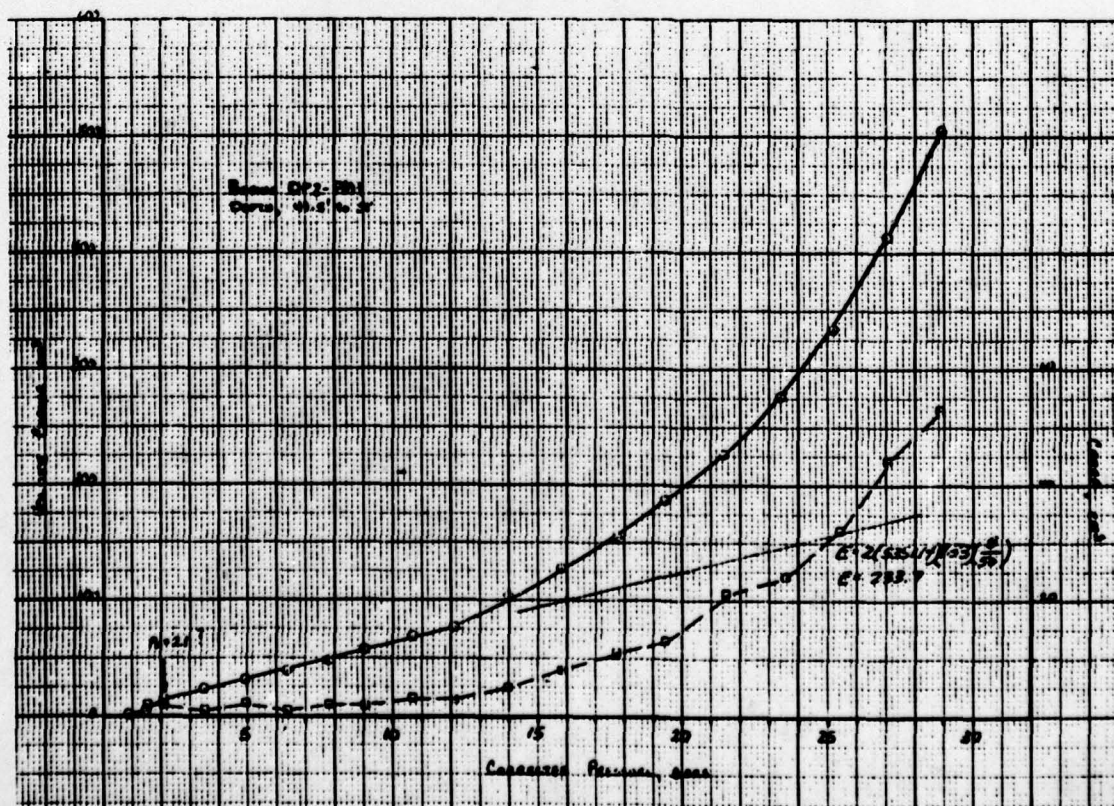
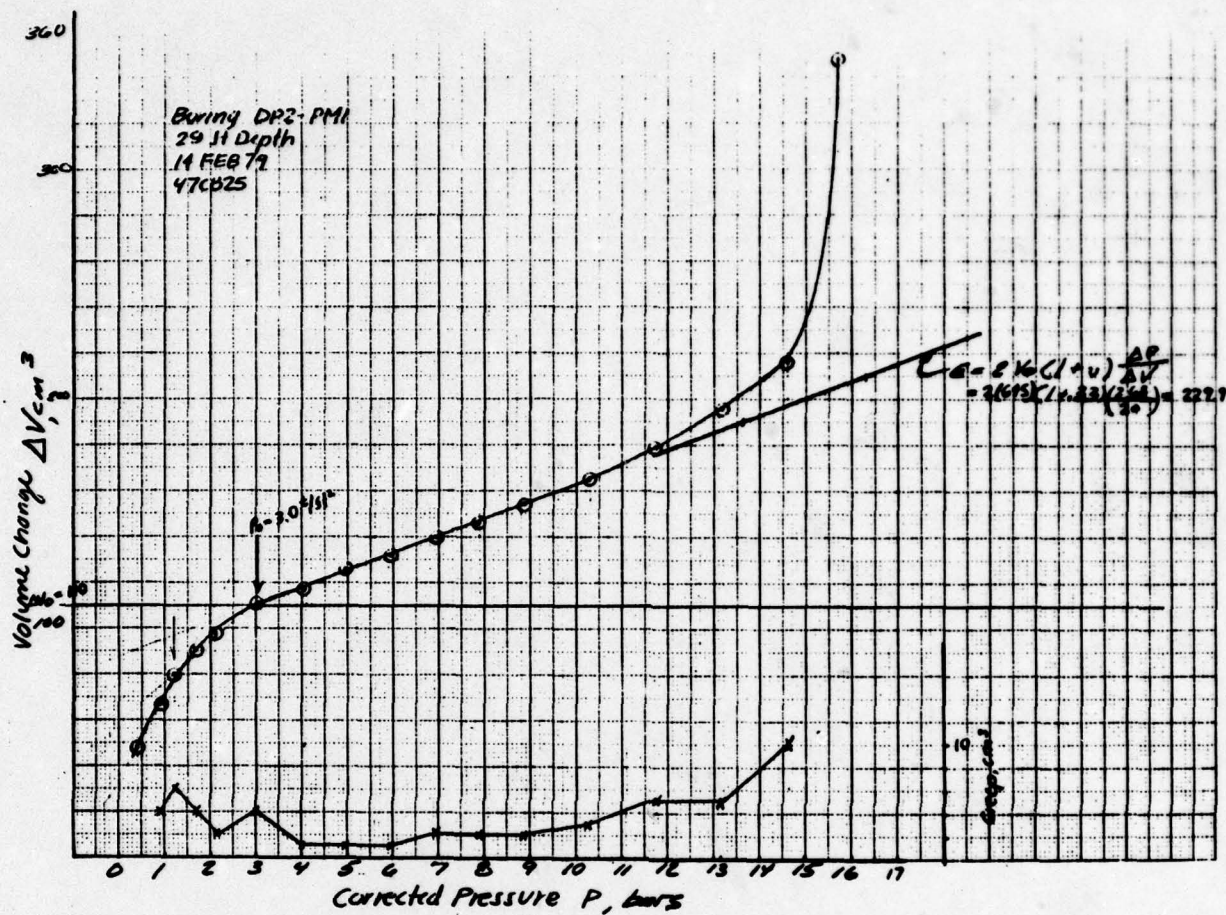
**TABLE OF CONTENTS**

Figure C.1  
through  
Figure C.9

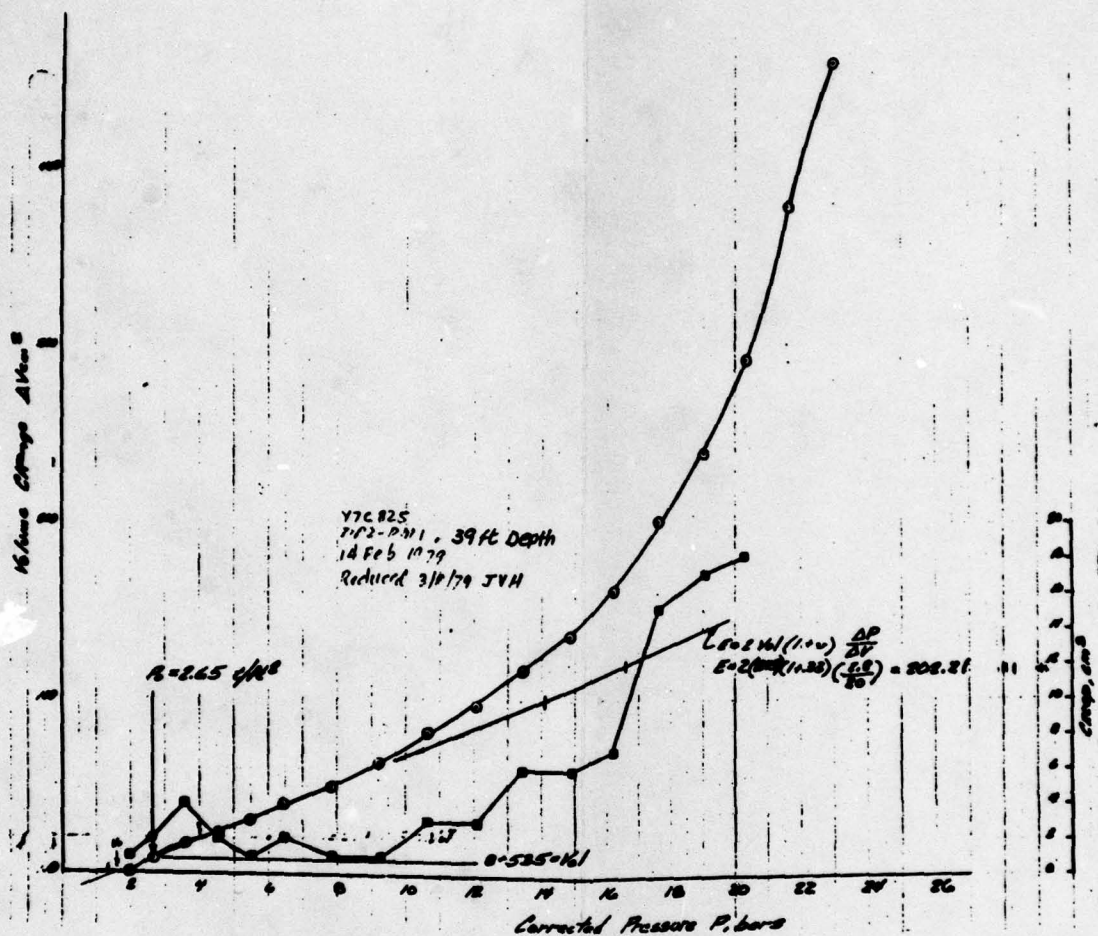
**PRESSUREMETER TEST RESULTS AFTER  
PILE INSTALLATION**

Figure C.10  
through  
Figure C.11

**STATIC CONE PENETRATION RESISTANCE AFTER  
PILE INSTALLATION**



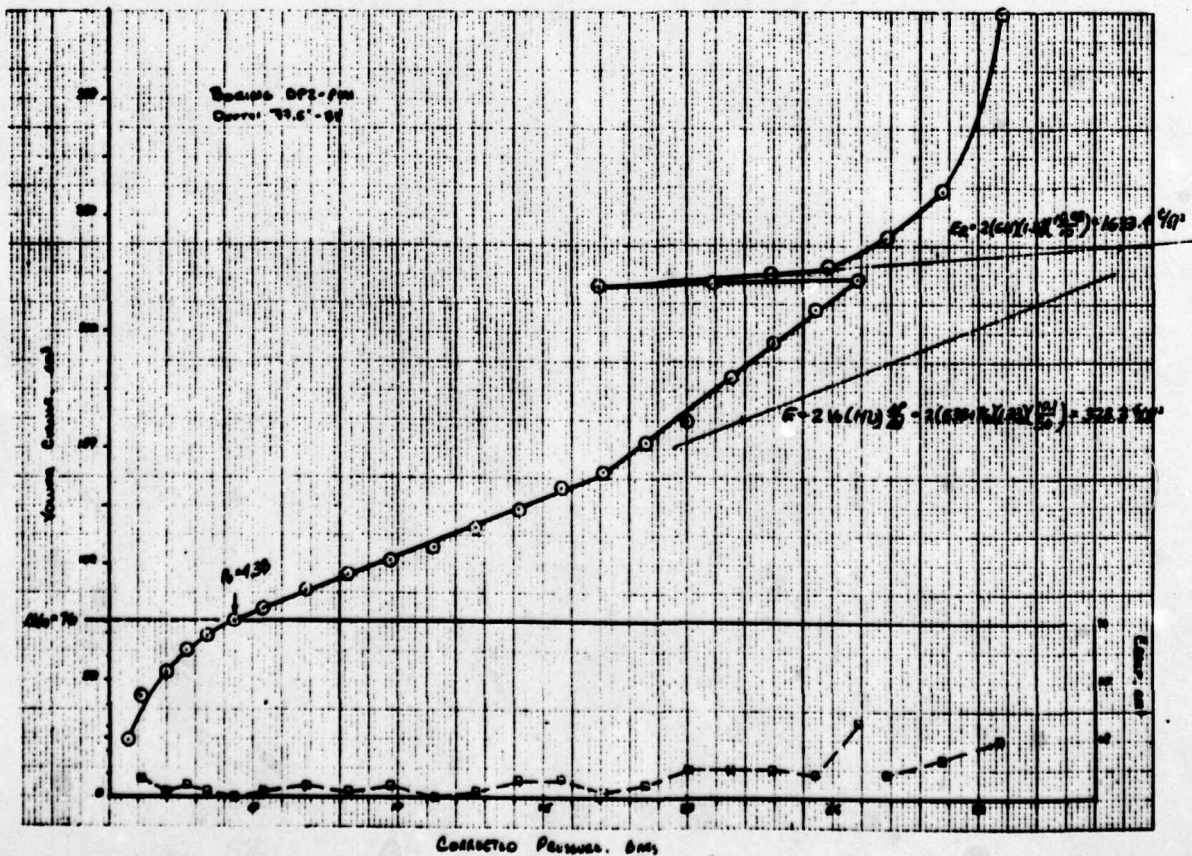
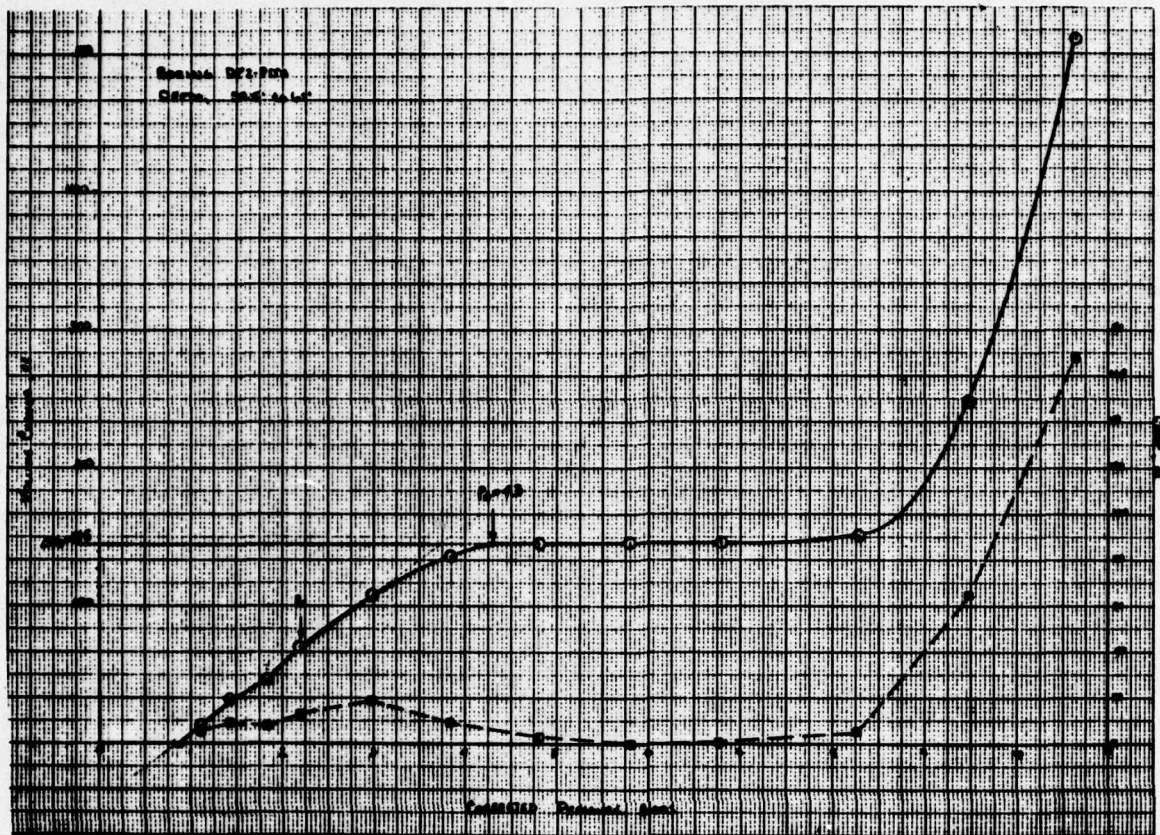




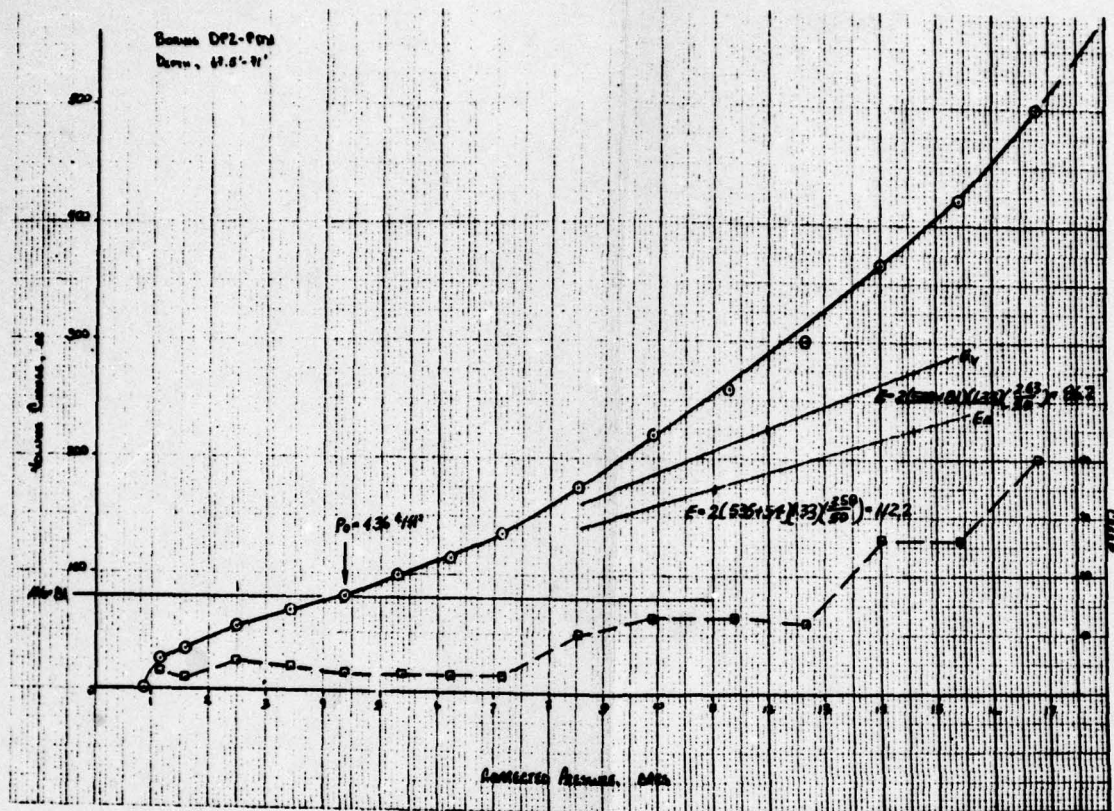
- Legend**
- Probe volume change versus corrected pressure
  - Creep versus corrected pressure
  - $R$  In situ horizontal stress
  - $E$  Elastic deformation modulus
  - $P_L$  Limit pressure

DRILLED-IN PILE TEST PROGRAM	
PRESSUREMETER TEST RESULTS AFTER PILE INSTALLATION BORING DP2-PM1	
FOUNDATION INVESTIGATION AND TEST PROGRAM EXISTING LOCKS AND DAM No. 26 ST LOUIS DISTRICT, CORPS OF ENGINEERS. DACW43-78-C-0006	
Woodward-Clyde Consultants Y7C825 Phase II	Fig. C.1


2

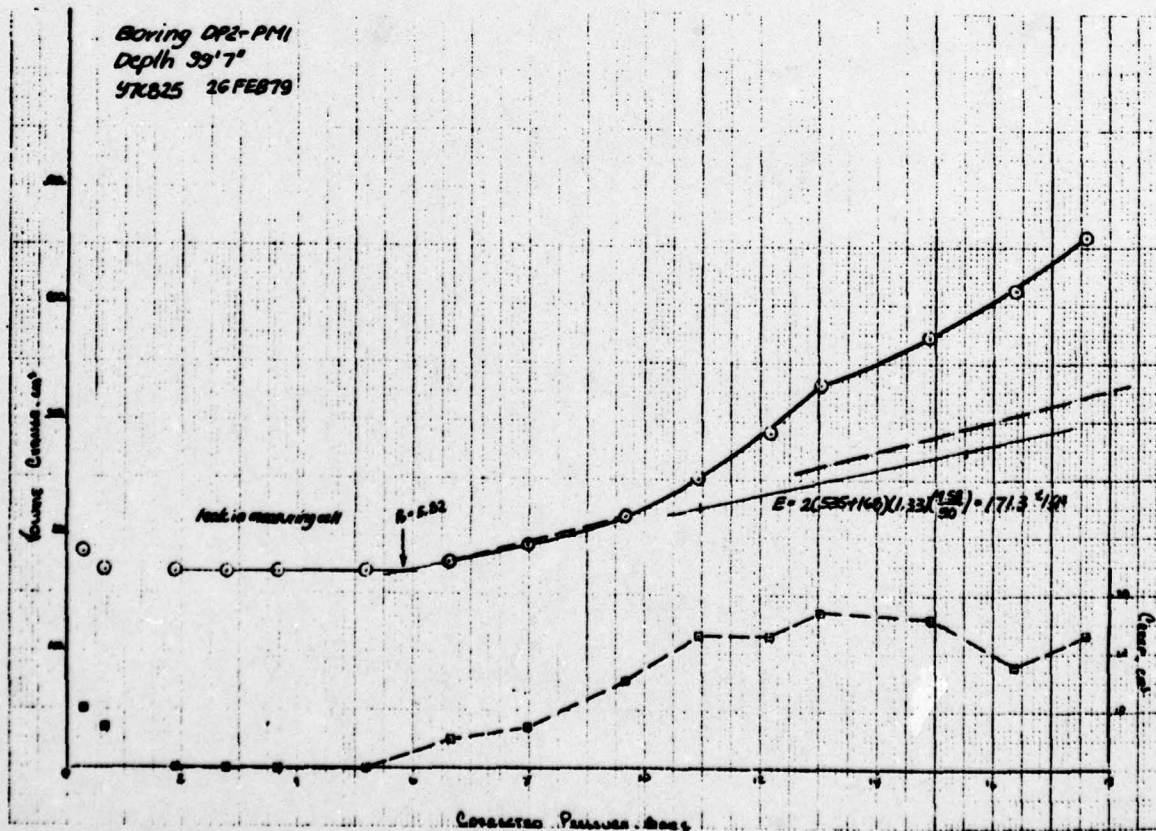
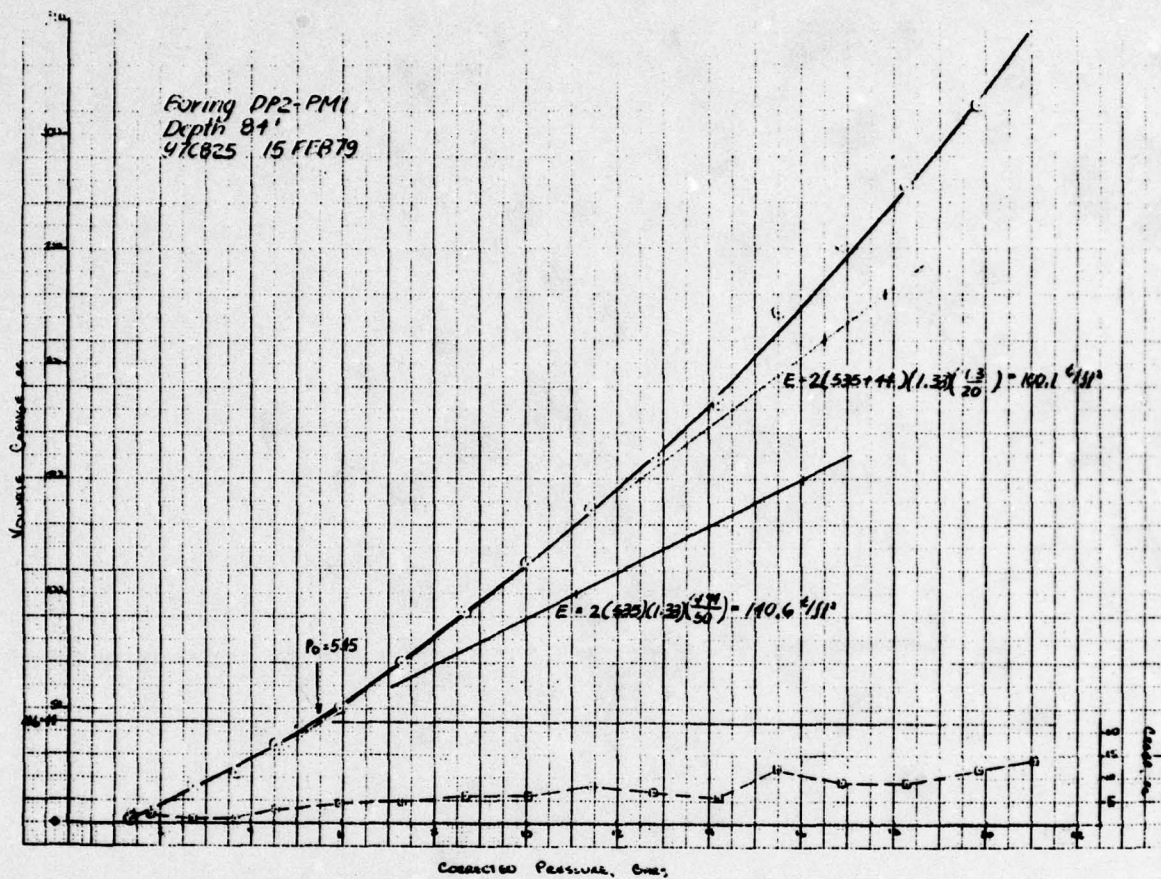




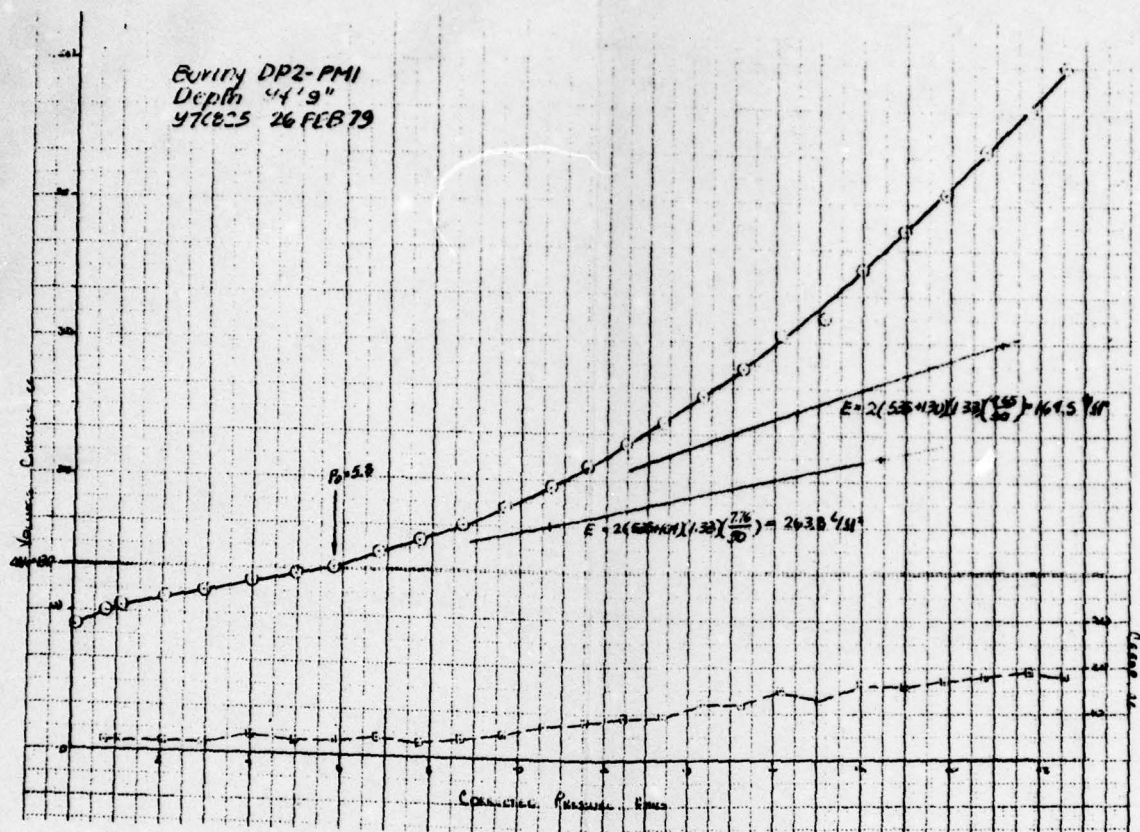


- Legend**
- Probe volume change versus corrected pressure
  - Creep versus corrected pressure
  - $P_0$  In situ horizontal stress
  - $E_s$  Elastic deformation modulus
  - $P_L$  Limit pressure

<b>DRILLED-IN PILE TEST PROGRAM</b>	
<b>PRESSUREMETER TEST RESULTS AFTER PILE INSTALLATION BORING DP2-PM1</b>	
FOUNDATION INVESTIGATION AND TEST PROGRAM EXISTING LOCKS AND DAM No. 26 ST LOUIS DISTRICT, CORPS OF ENGINEERS. DACW43-76-C-0002	
 Woodward-Clyde Consultants YTCSS Phase III	<b>Fig. C.2</b>



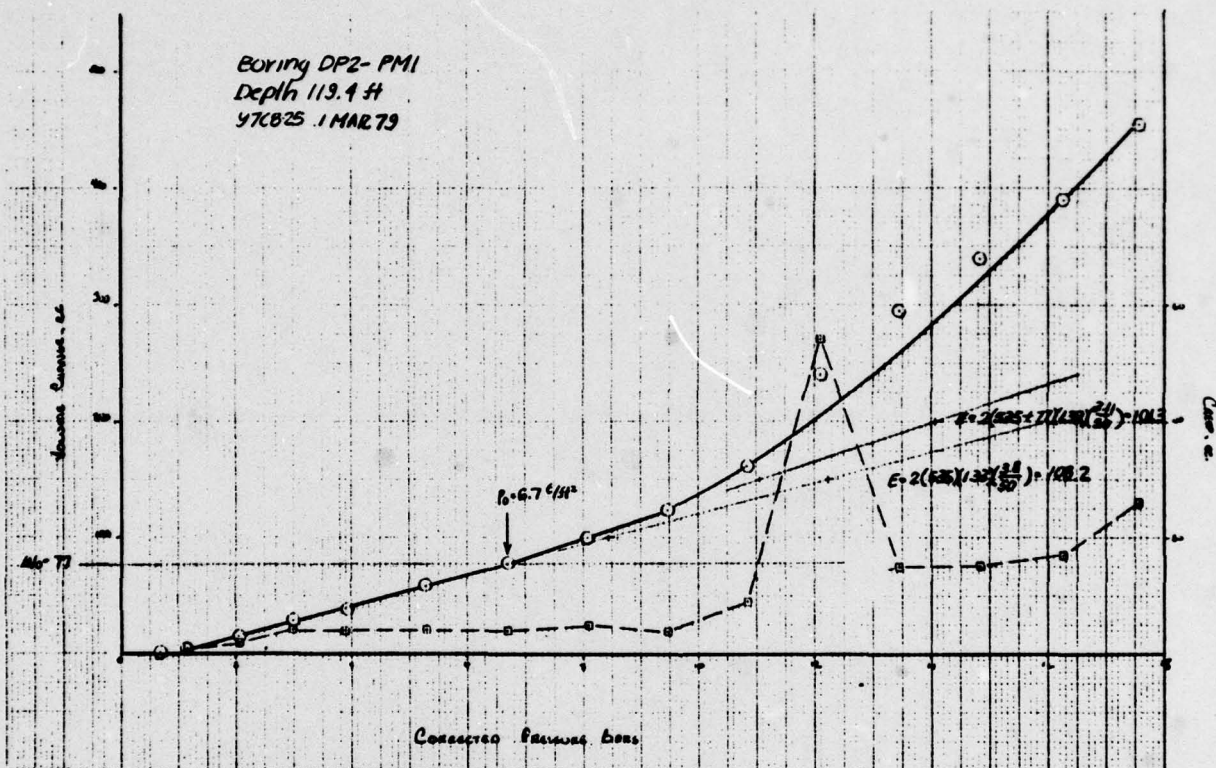




- Legend**
- Probe volume change versus corrected pressure
  - Creep versus corrected pressure
  - $P_0$  In situ horizontal stress
  - $E_s$  Elastic deformation modulus
  - $P_l$  Limit pressure

<p align="center"><b>DRILLED-IN PILE TEST PROGRAM</b></p> <p align="center"><b>PRESSUREMETER TEST RESULTS</b></p> <p align="center"><b>AFTER PILE INSTALLATION</b></p> <p align="center"><b>BORING DP2-PM1</b></p>	
<p align="center">FOUNDATION INVESTIGATION AND TEST PROGRAM</p> <p align="center">EXISTING LOCKS AND DAM No. 28</p> <p align="center">ST LOUIS DISTRICT, CORPS OF ENGINEERS.</p> <p align="center">DACW43-78-C-0006</p>	
<p align="center">Woodward-Clyde Consultants</p> <p align="center">47C25 Photo IX</p>	<p align="center"><b>Fig. C.3</b></p>

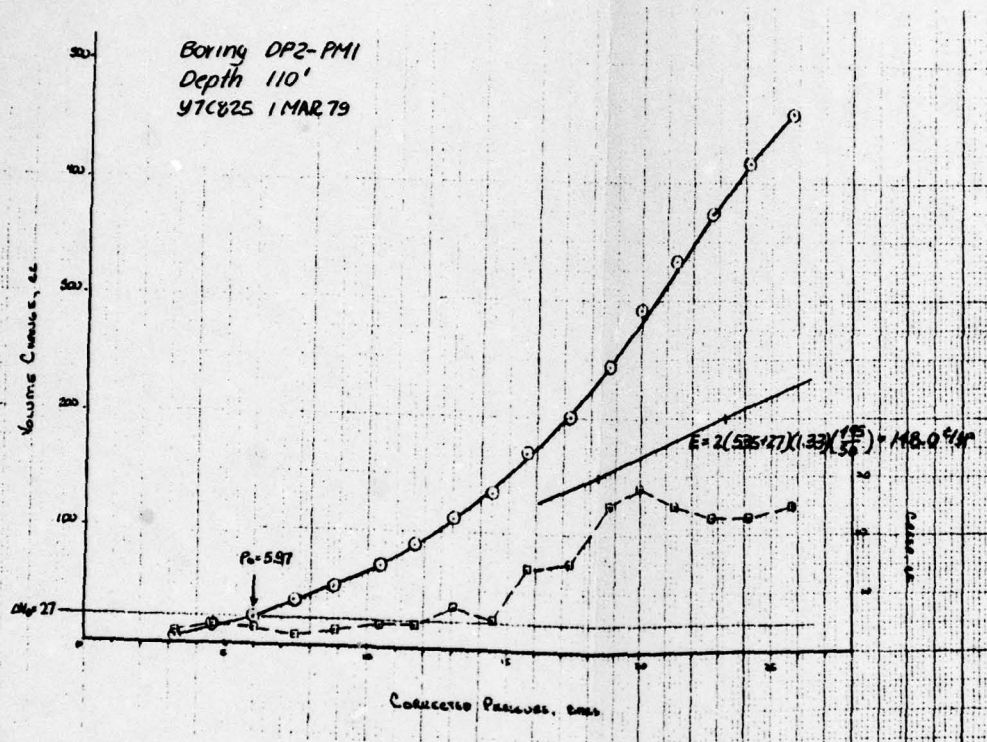
Boring DP2-PM1  
 Depth 113.4 ft  
 47C825 1 MAR 79



Volume Change, %

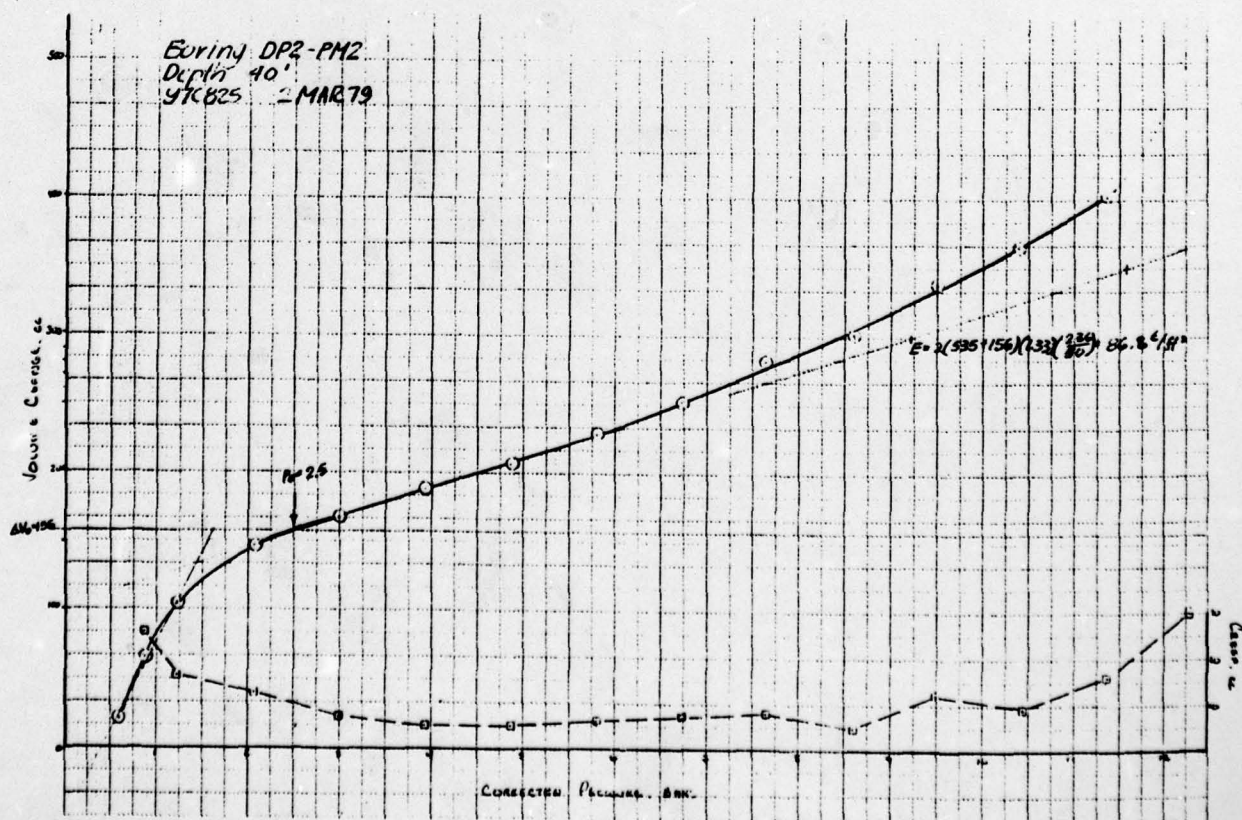
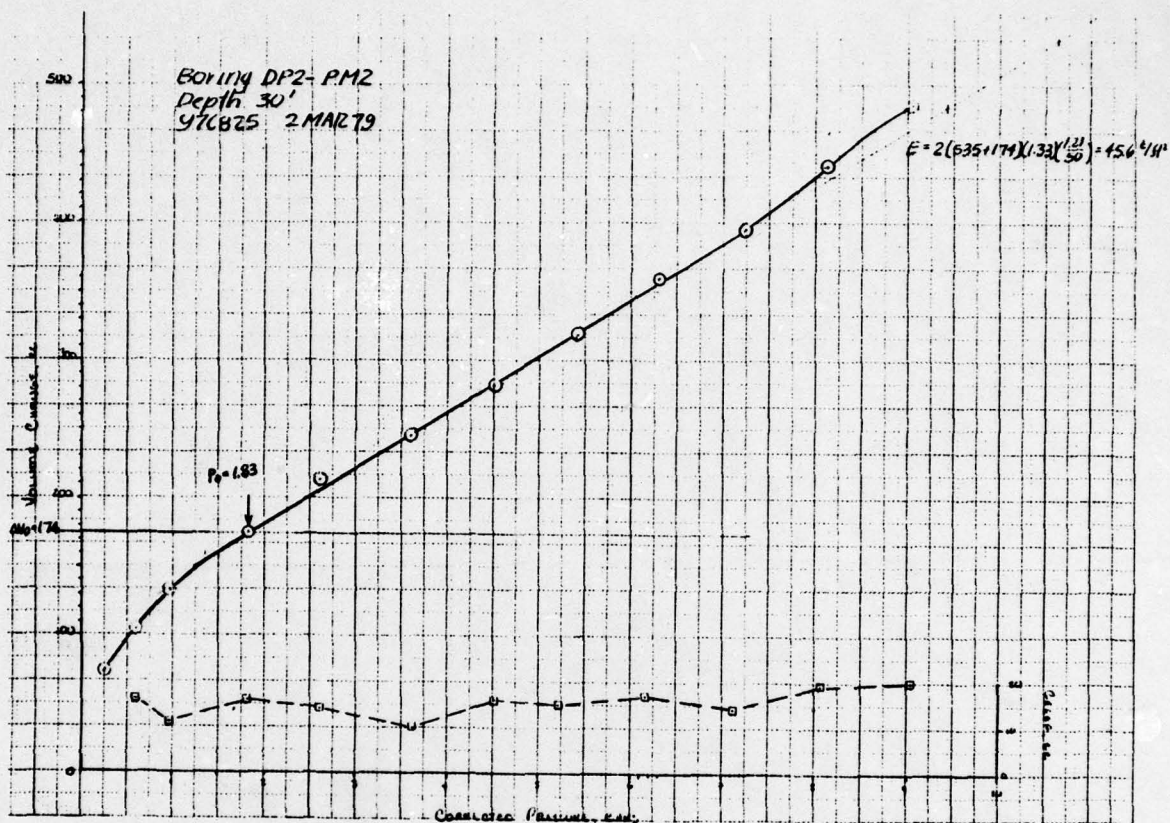
DP 27



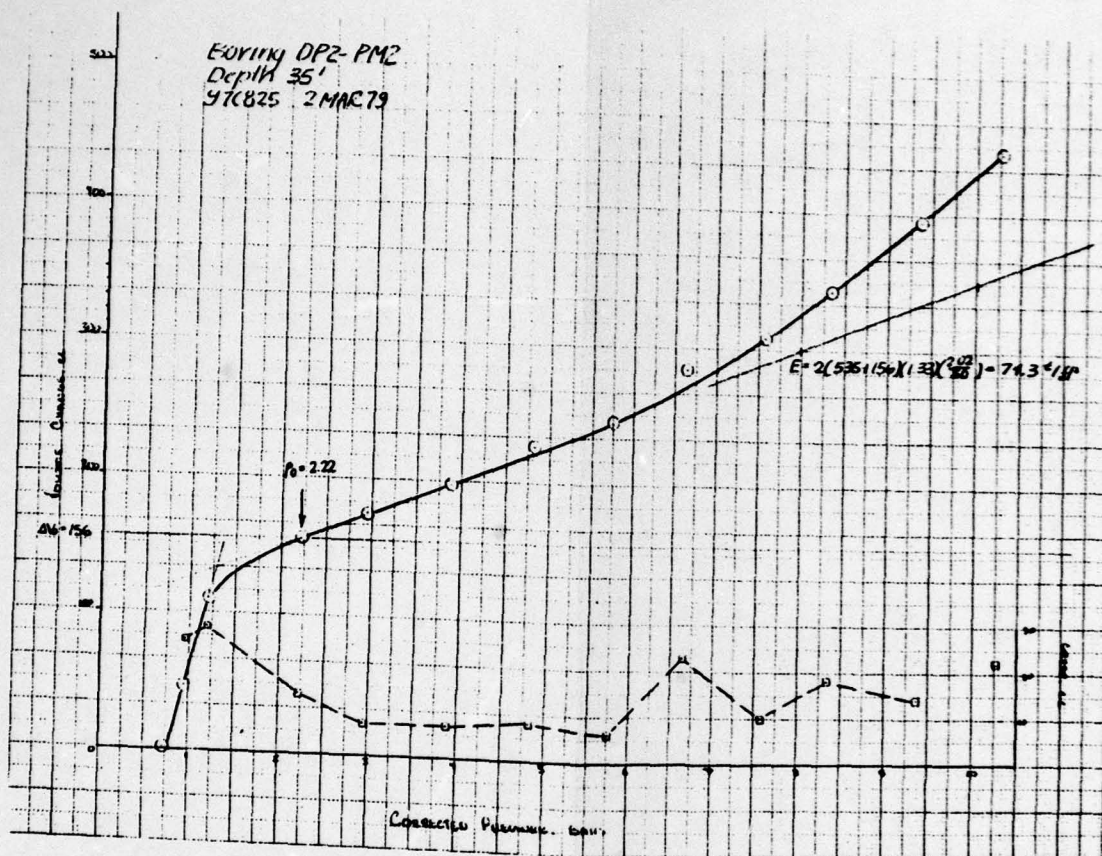


- Legend**
- Probe volume change versus corrected pressure
  - Creep versus corrected pressure
  - $P_0$  In situ horizontal stress
  - $E_s$  Elastic deformation modulus
  - $P_L$  Limit pressure

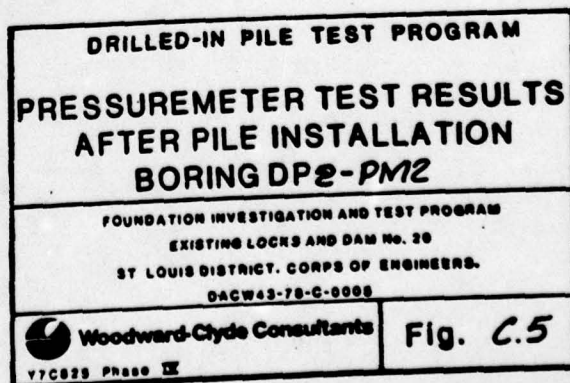
<b>DRILLED-IN PILE TEST PROGRAM</b>	
<b>PRESSUREMETER TEST RESULTS BEFORE PILE INSTALLATION BORING DP2-PM1</b>	
FOUNDATION INVESTIGATION AND TEST PROGRAM EXISTING LOCKS AND DAM No. 26 ST LOUIS DISTRICT, CORPS OF ENGINEERS. DACW43-78-C-0005	
Woodward-Clyde Consultants Y7C825 Photo III	<b>Fig. C.4</b>

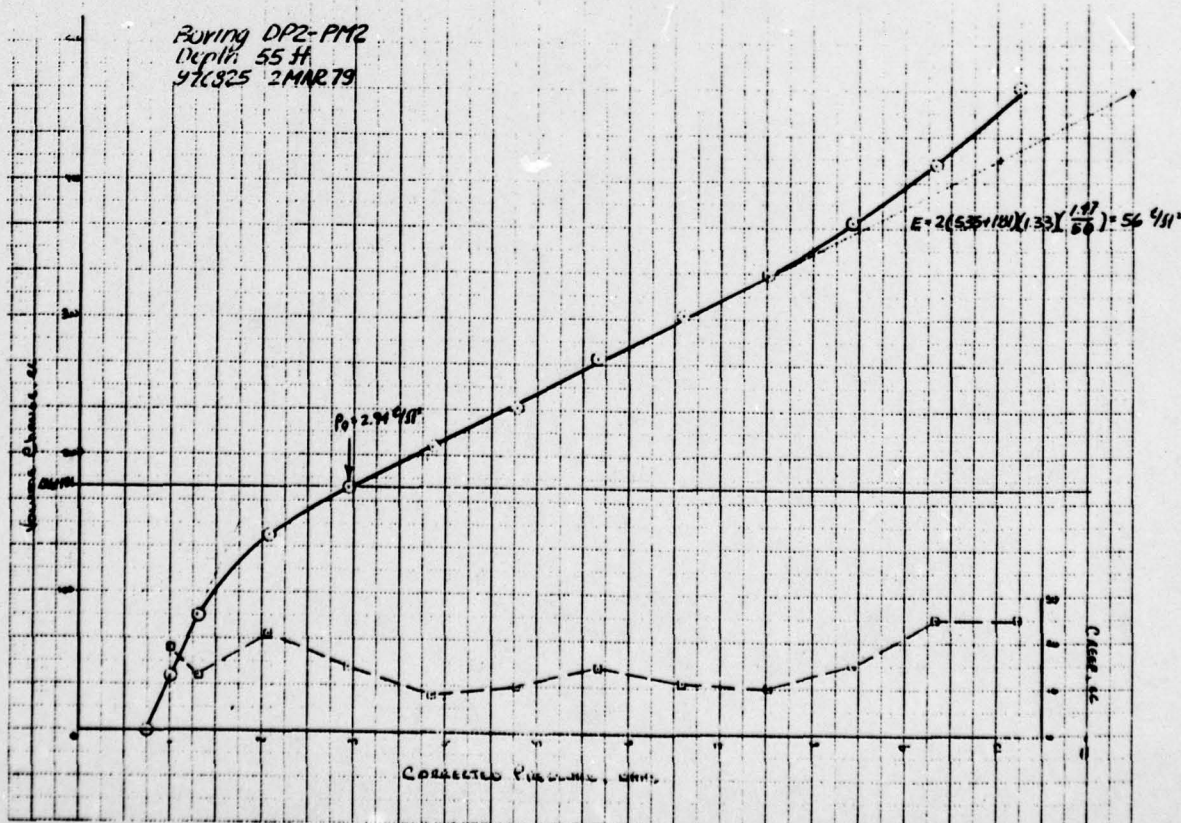
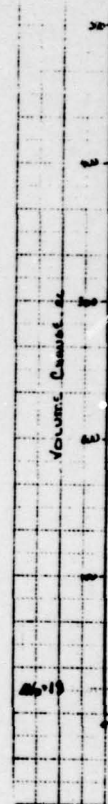
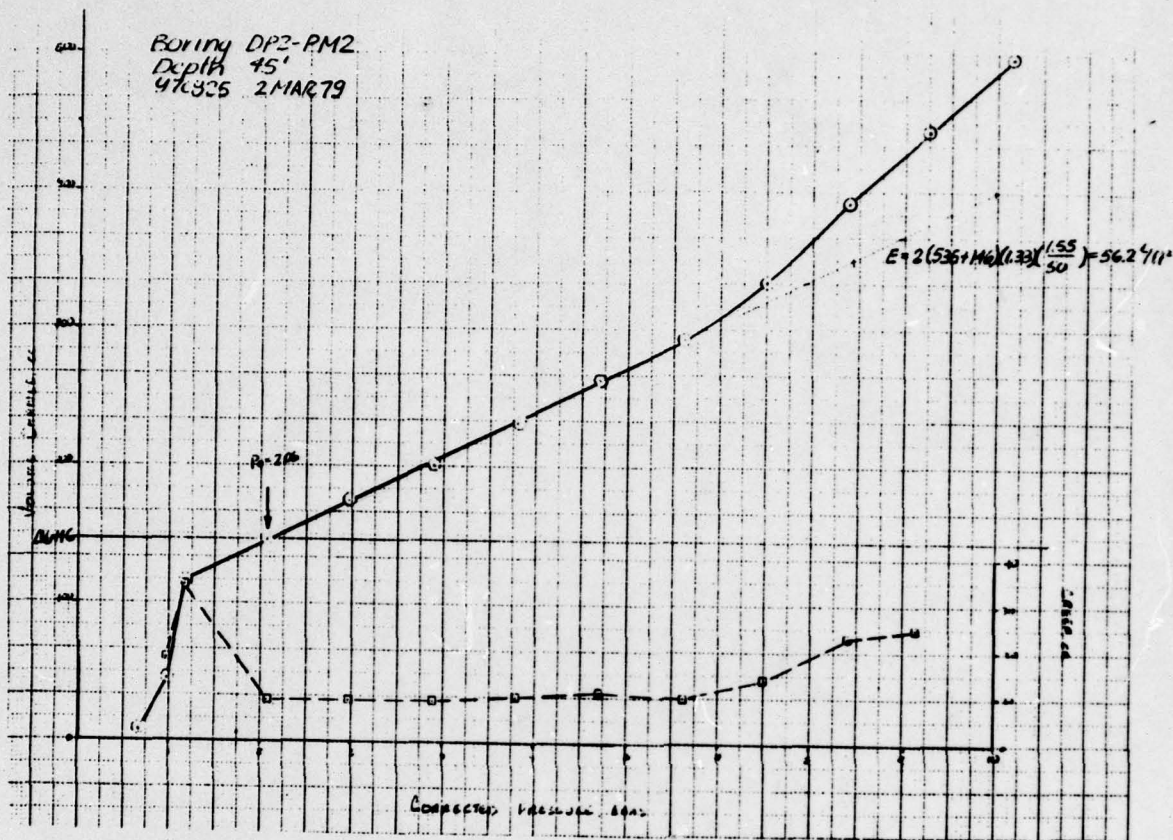






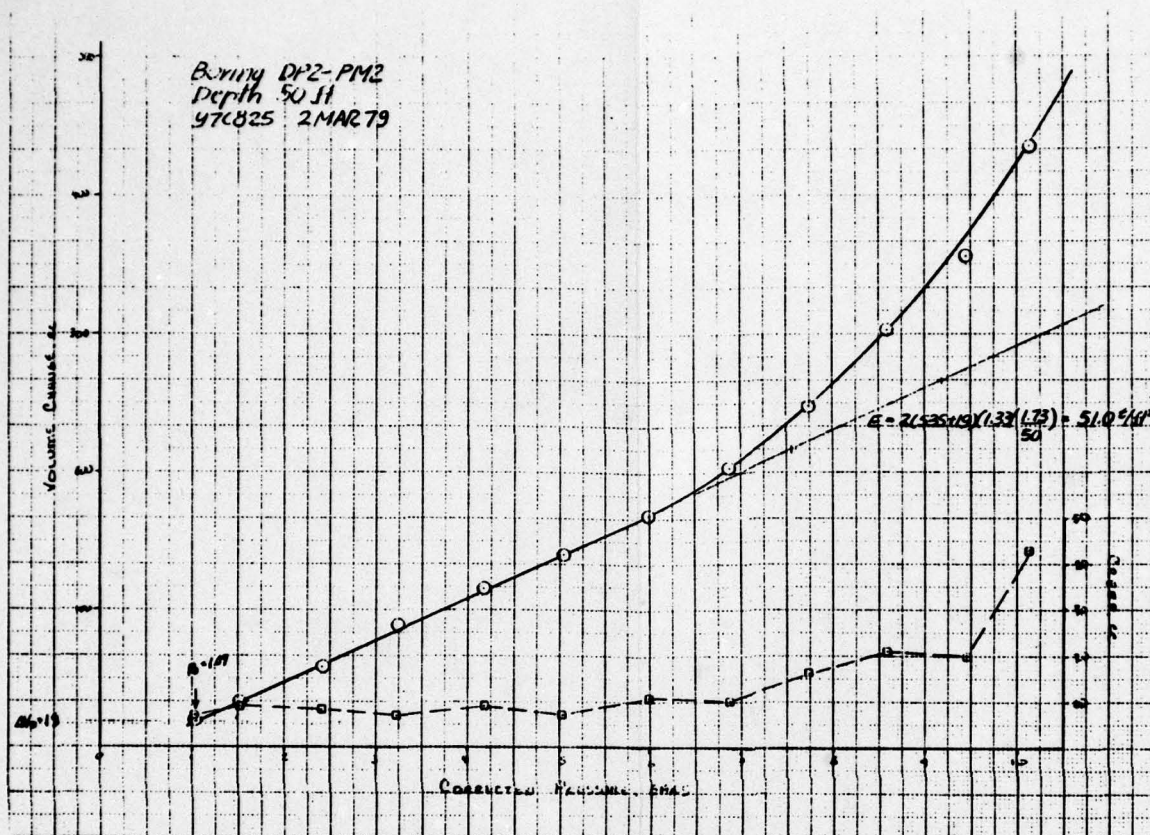
- Legend**
- Probe volume change versus corrected pressure
  - Creep versus corrected pressure
  - $P_0$  In situ horizontal stress
  - $E_s$  Elastic deformation modulus
  - $P_f$  Limit pressure





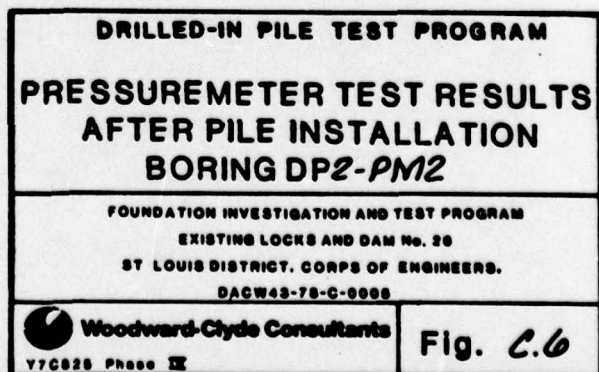
- Pre
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- $P_0$  In
- $E_s$  Eka
- ma
- $P_1$  Lin

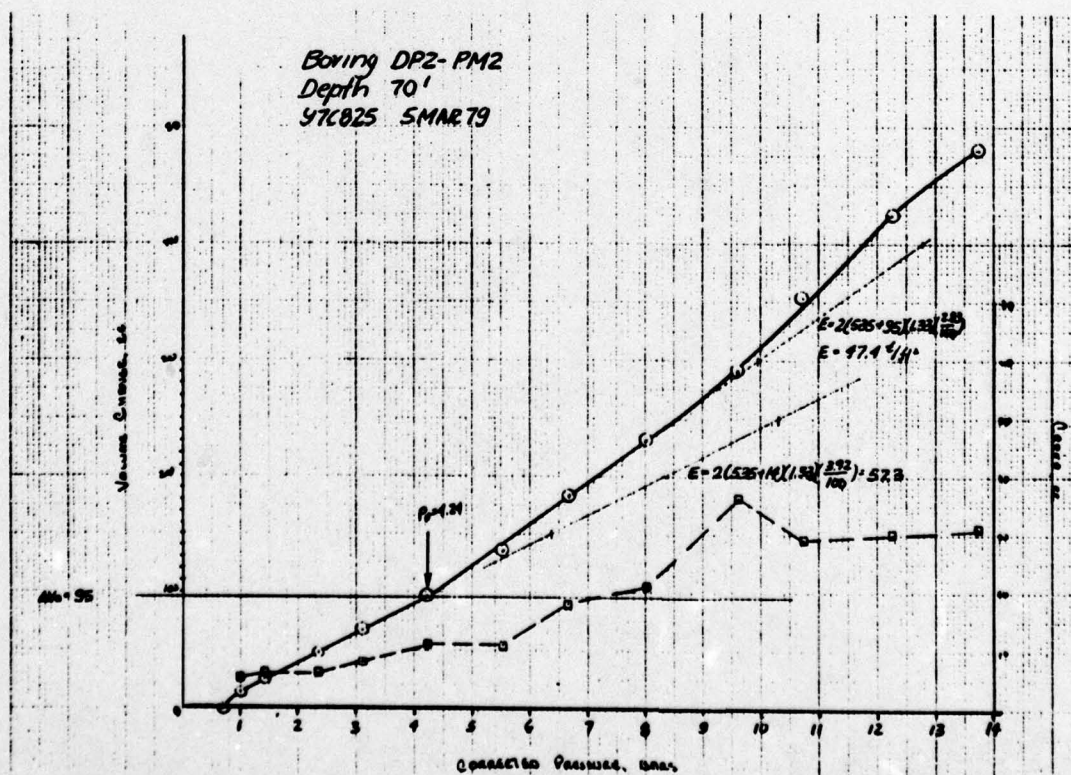
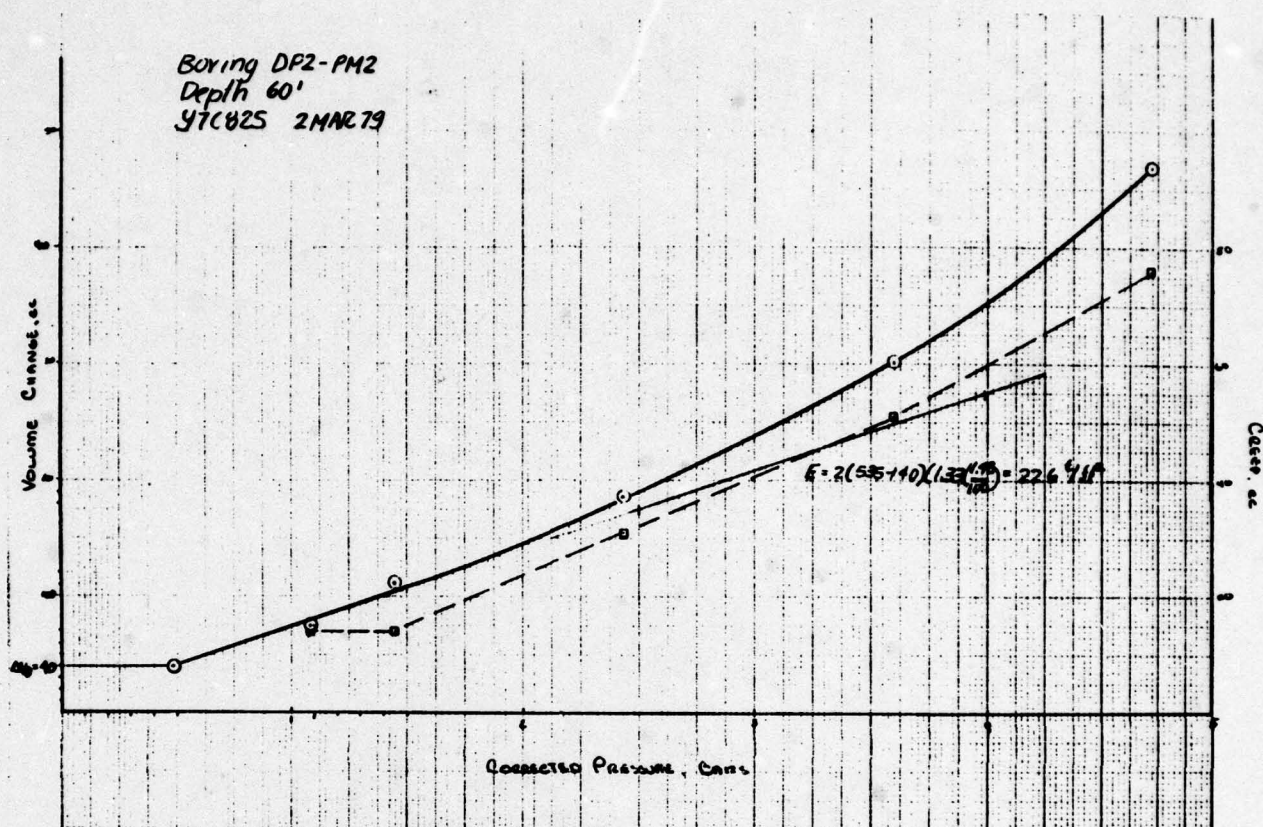




### Legend

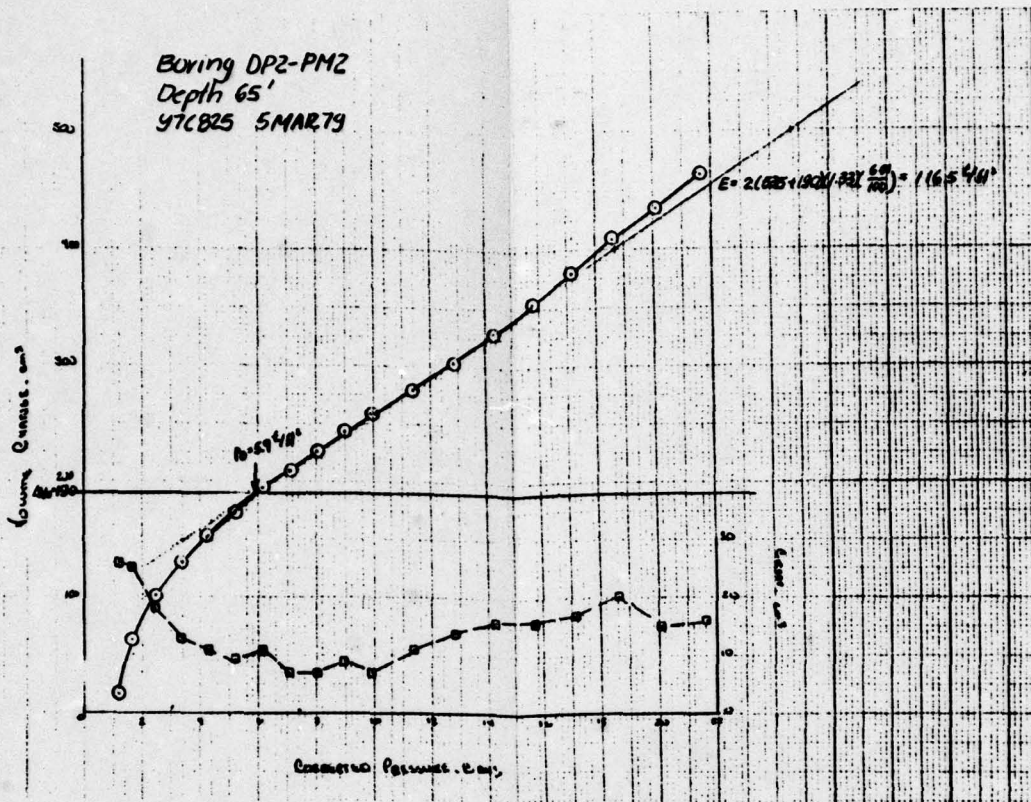
- Probe volume change versus corrected pressure
- Creep versus corrected pressure
- $P_0$  In situ horizontal stress
- $E_s$  Elastic deformation modulus
- $P_L$  Limit pressure





○  $P_0$   
□  $C_0$   
△  $P_1$   
△  $P_2$   
△  $P_3$   
△  $P_4$   
△  $P_5$   
△  $P_6$   
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△  $P_{98}$   
△  $P_{99}$   
△  $P_{100}$

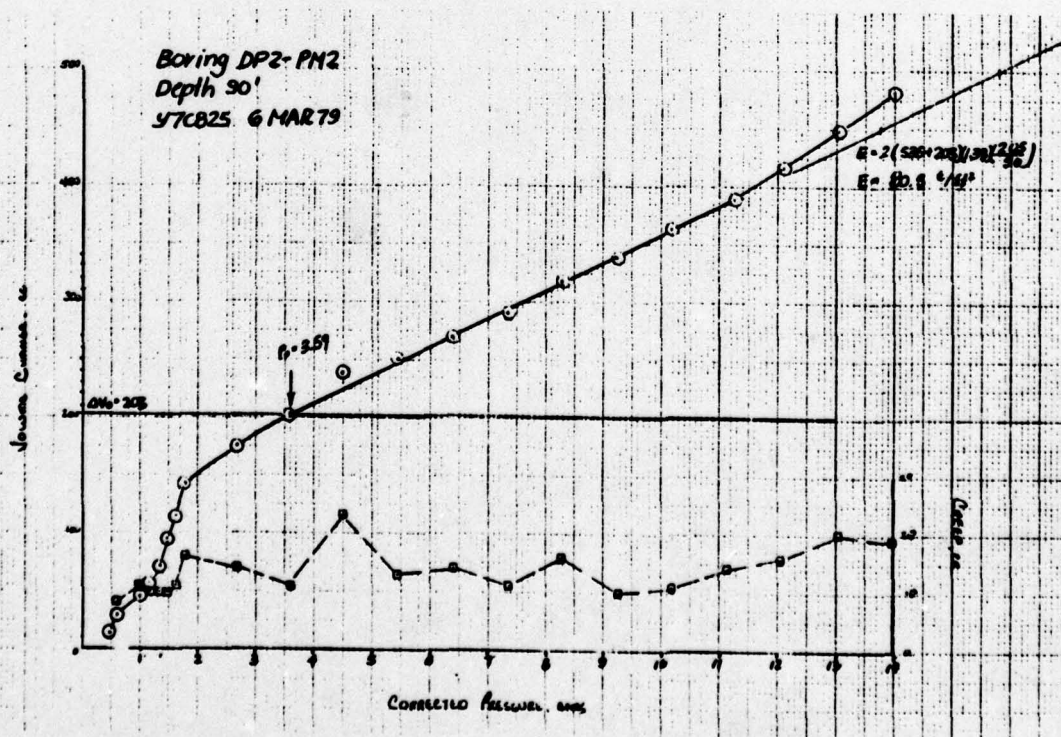
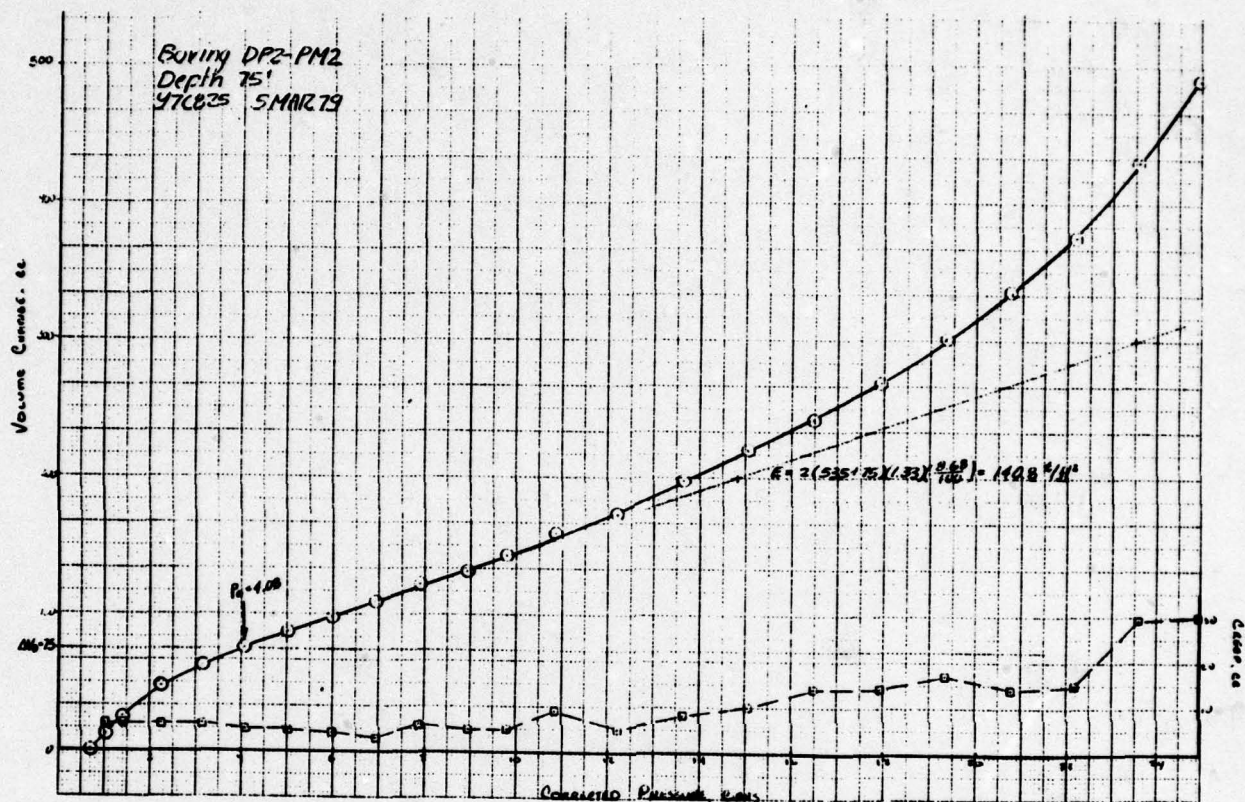




#### Legend

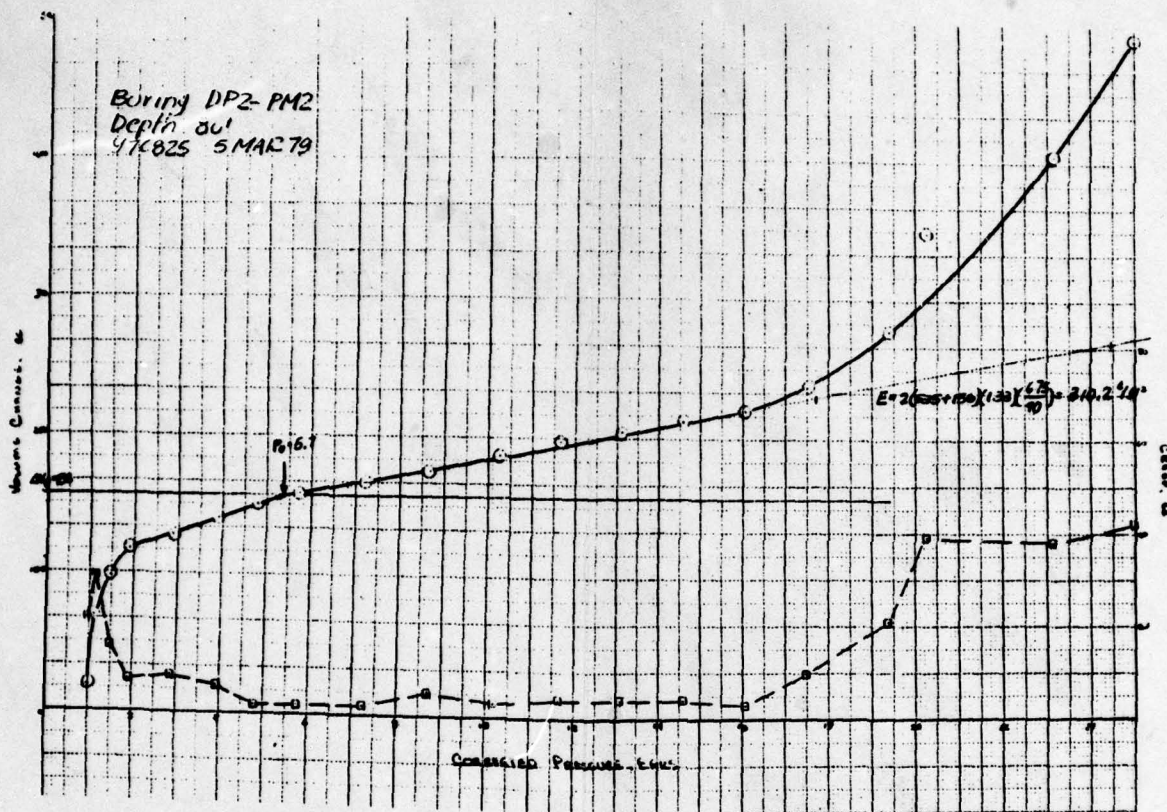
- Probe volume change versus corrected pressure
- Creep versus corrected pressure
- $P_h$  In situ horizontal stress
- $E_s$  Elastic deformation modulus
- $P_l$  Limit pressure

<b>DRILLED-IN PILE TEST PROGRAM</b>	
<b>PRESSUREMETER TEST RESULTS AFTER PILE INSTALLATION BORING DP2-PM2</b>	
FOUNDATION INVESTIGATION AND TEST PROGRAM EXISTING LOCKS AND DAM No. 26 ST LOUIS DISTRICT, CORPS OF ENGINEERS. DACW43-78-C-0005	
Woodward-Clyde Consultants Y7C825 Phase III	<b>Fig. C.7</b>




- Legend
- Probe vol. corrected
  - Creep vol. pressure
  - $P_0$  In situ  $P_0$
  - $E_s$  Elastic modulus
  - $P_f$  Limit pressure



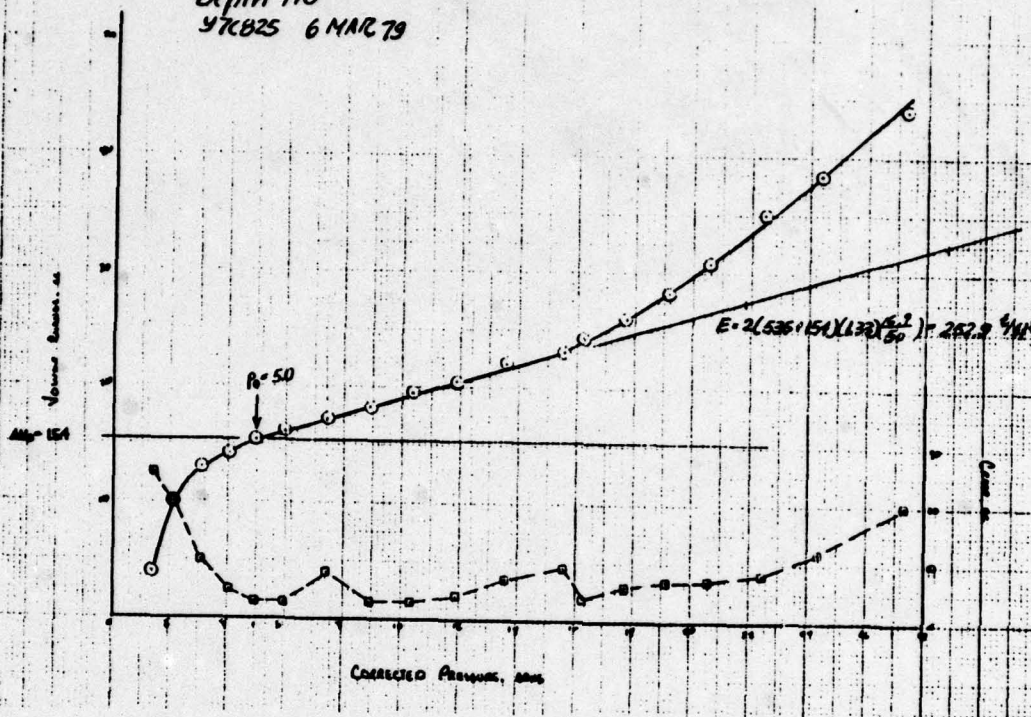


#### Legend

- Probe volume change versus corrected pressure
- Creep versus corrected pressure
- △ In situ horizontal stress
- E<sub>s</sub> Elastic deformation modulus
- P<sub>1</sub> Limit pressure

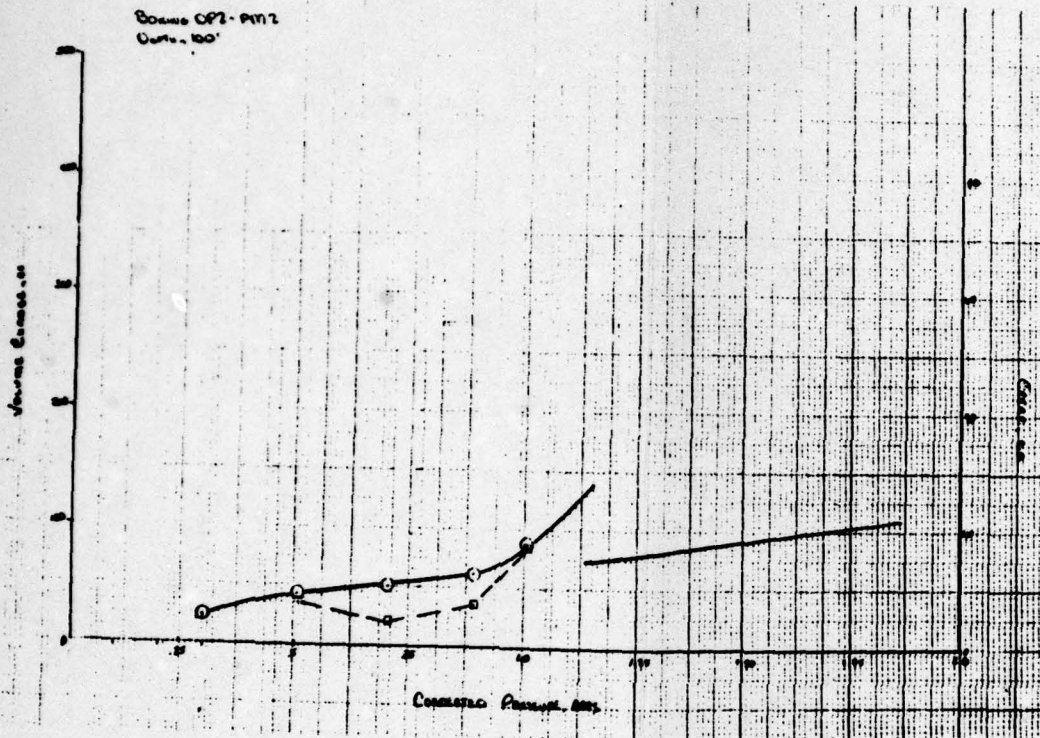
<p align="center"><b>DRILLED-IN PILE TEST PROGRAM</b></p> <p align="center"><b>PRESSUREMETER TEST RESULTS</b></p> <p align="center"><b>AFTER PILE INSTALLATION</b></p> <p align="center"><b>BORING DP2-PM2</b></p>	
<p align="center">FOUNDATION INVESTIGATION AND TEST PROGRAM</p> <p align="center">EXISTING LOCKS AND DAM No. 26</p> <p align="center">ST LOUIS DISTRICT, CORPS OF ENGINEERS.</p> <p align="center">DACW43-78-C-0005</p>	
<p align="center"> Woodward-Clyde Consultants</p> <p align="center">Y7C825 Phase III</p>	<p align="center">Fig. C.8</p>

Boring DP2-PM2  
Depth 110'  
97CB25 6 MAR 79



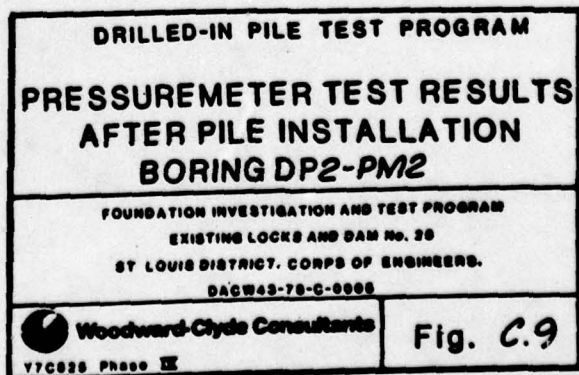
- Pre
- can
- Cre
- pres
- $R$  in
- $E_s$  Ele
- ma
- $P_f$  Lin





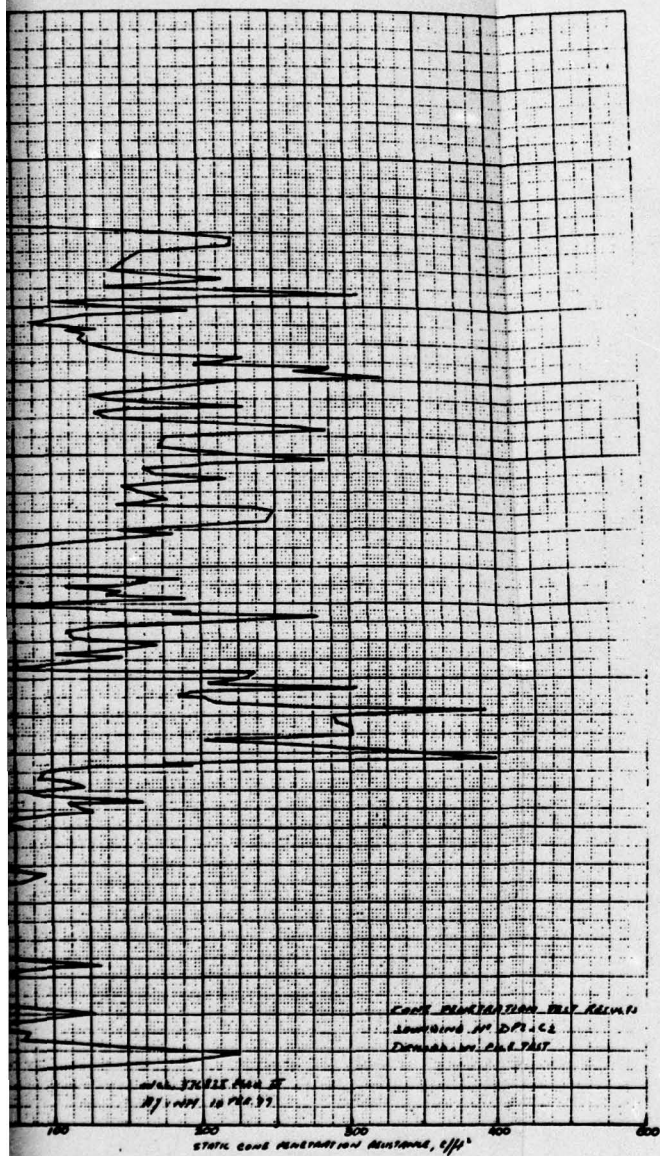
#### Legend

- Probe volume change versus corrected pressure
- Creep versus corrected pressure
- $P_0$  In situ horizontal stress
- $E_s$  Elastic deformation modulus
- $P_L$  Limit pressure










**DRILLED-IN PILE TEST PROGRAM**

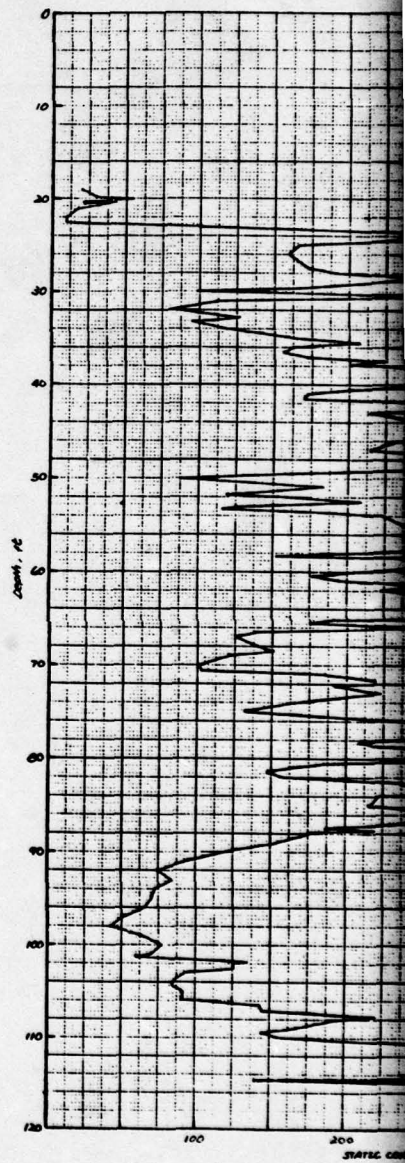
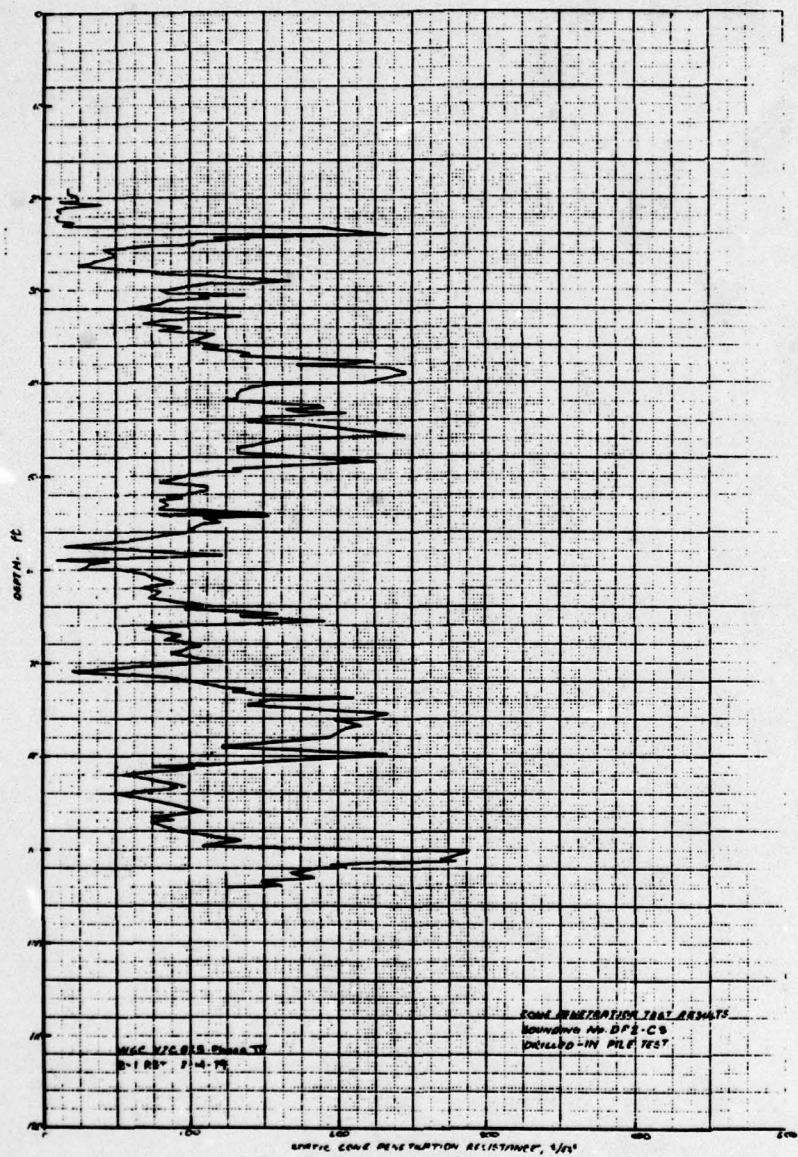
**STATIC CONE  
PENETRATION RESISTANCE  
AFTER PILE INSTALLATION  
BORING DP2- C1 and C2**

FOUNDATION INVESTIGATION AND TEST PROGRAM  
EXISTING LOCKS AND DAM No. 26  
ST LOUIS DISTRICT, CORPS OF ENGINEERS.  
DACW43-78-C-0005

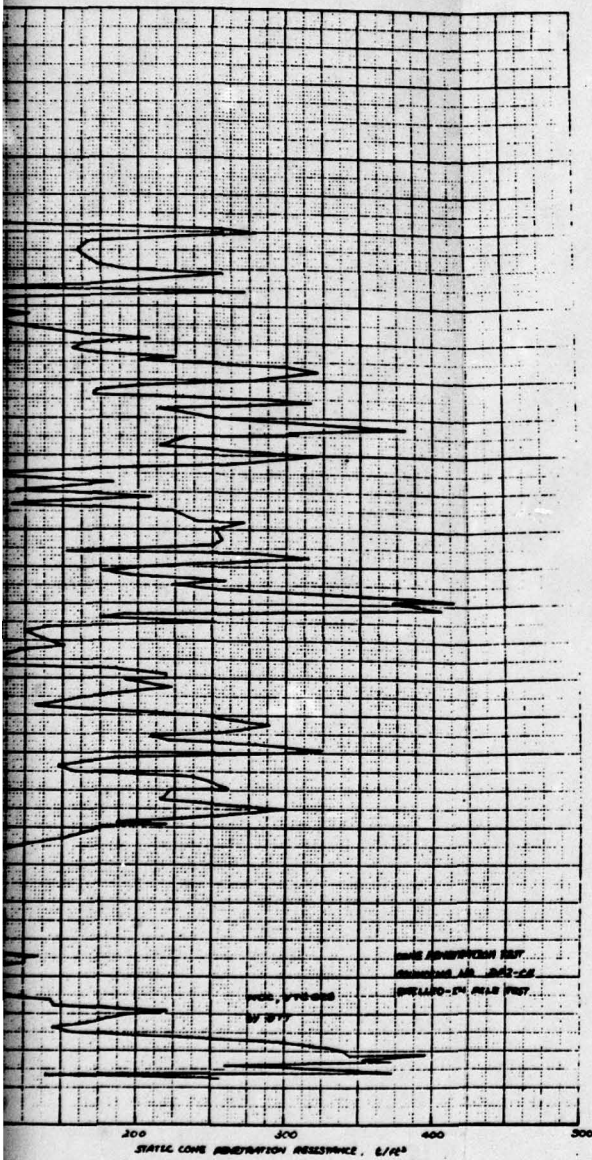
 Woodward-Clyde Consultants

**Fig. C.10**

V7C826 Phase IX







**DRILLED-IN PILE TEST PROGRAM**

**STATIC CONE  
PENETRATION RESISTANCE  
AFTER PILE INSTALLATION  
BORING DP2- C3 and C4**

FOUNDATION INVESTIGATION AND TEST PROGRAM  
EXISTING LOCKS AND DAM NO. 26  
ST LOUIS DISTRICT, CORPS OF ENGINEERS.  
DACW43-78-C-0005



**Woodward-Clyde Consultants**

V7C826 Phase IX

**Fig. C.11**

**PHASE IV REPORT**

**VOLUME IVA**

**RESULTS AND INTERPRETATION OF  
DRILLED-IN PILE TEST PROGRAM**

**APPENDIX D**

**OBSERVATIONS DURING DRILLING OPERATIONS**



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Page D-1 through Page D-37  
INSTALLATION LOG, PILE NO. DP1



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 11/15/78  
Observer SFG

INSTALLATION LOG, FILE NO. DP-1

Batter 4 V. to 1 H.

Operating Crew:

G.S. Elevation ±422ft

Supervisors Tricher Operators 1

Weather Cold, cloudy 34°-38°

Laborers 1 Others 3

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 20.2	8:56	clay	Max		6.7	▲ Soil @ Elev. 409' at start. @ Elev. 405' after 36 min., 5 ft above casing tip. ▲ Having problems in opening hammer-grab. Eased by saturating mechanism w/ oil. ▲ clay sticks to the insidewall of the grab. Laborers remove w/ shovel.
Soil 15	9:32		Min	Note (1)		
			Mean			
Casing 20.2	9:32	clay	Max		5.0	▲ Attempt to twist and advance casing. Gripper slips. Inserted steel strapping strips parallel to casing axis. Improved grippers but not adequately.
Soil 16	9:44		Min			
			Mean			
Casing 24	9:50	clay to 24 ft fine sand	Max		11.5	▲ Sand encountered at 24 ft depth. ▲ Gripper slipping again.
Soil 25	10:37	below.	Min			
			Mean			
Casing 28.5	10:37	Brown, fine to med SAND	Max		3.4	▲ Soil @ Elev. 393 at 11:12 G.W.L @ Elev. 395 ± ▲ Gripper slipping. Casing oscillating sporadically and advancing intermittently
Soil 27	11:12		Min			
			Mean			
Casing 31	11:12	Brown, fine to med SAND	Max		4.3	▲ Gripper still slipping. Contractor plans on welding hard steel beads on inside of gripper ring and widening gaps between clamp segments.
Soil 29	11:40	to 28'. Grey fine to med SAND below 28'	Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note: (1) Torque and thrust pressure not recorded.  
Data not valid due to slippage

(2) Large, 2 prong hammer-grab was used in excavation.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 20  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 11/15 - 11/16/78  
Observer D. TSO

INSTALLATION LOG, PILE NO. DP-1

Batter 4 V. to 1 H.

Operating Crew: 2nd shift

G.S. Elevation ±422ft

Supervisors 1 Operators 1

Weather \_\_\_\_\_

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 31	18:55		Max			▲ Weld the 3rd section of casing and grind flush.
Soil	+0		Min			▲ 21:00 ~ 21:40 Coffee break
29	0:15		Mean			
Casing 37	0:15	Grey fine to med. sand.	Max			▲ Advance the casing for 9 ft. Difficulty was experienced in pressing down the casing. Rig was lifted up while pushing.
Soil	+0	some coarse sand, trace fine gravel.	Min		2.9	
34.5	2:10		Mean 400			
Casing 37	2:10		Max			▲ At 2:10 the rig was down because a pin connector for the hammer grab fell off. No spare one was available to replace.
Soil	+0		Min			▲ Crew knocked off at 2:50
34.5	2:50		Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note: 1) Large, 2 prong hammer-grab was used in excavation.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 11/16/78  
Observer R.Q.

D-3

INSTALLATION LOG, PILE NO. DP-1

Batter 4 V. to 1 H.

Operating Crew: 1st shift

G.S. Elevation ±422ft

Supervisors Tricher Operators 2

Weather cloudy, ~ 45°

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 37 Soil 34.5	7:00 to 9:00	N/A	Max Min Mean	N/A	N/A	▲ Replace the pin connector of the hammer-grab.
Casing 40 Soil 35.5	9:00 to 10:35	Grey fine SAND trace silt.	Max 400 Min 225 Mean		0.6	▲ slow progress. Poor penetration w/ hammer-grab.
Casing 41 Soil 37.5	10:35 to 11:50	"	Max 300 Min 250 Mean		1.6	▲ poor penetration w/ hammer-grab ▲ 37 seconds to complete an excavation cycle.
" " 12:00 to 12:30		N/A	Max Min Mean	N/A	N/A	▲ Lunch break.
Casing 44 Soil 39	12:30 to 13:30	Grey fine SAND. trace silt.	Max 300 Min 250 Mean		1.5	▲ Penetration w/ hammer-grab improved.
Casing 44 Soil 39	13:30 to 14:30	N/A	Max Min Mean	N/A	N/A	▲ A bomb threat was notified @ 13:30 ▲ Work was shut down for the rest of shift.
			Max Min Mean			
			Max Min Mean			

Note:

m) Excavation tool: large, 2 prong hammer-grab.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 11/17/78  
Observer RO. SFG

D-4

INSTALLATION LOG, FILE NO. DP-1

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather cloudy, rain showers

Operating Crew:

Supervisors Tricher Operators 1

Laborers 3 Others 2

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 49 Soil 13	7:00 to 8:30	Grey fine SAND. trace silt.	Max 350 Min 250 Mean		3.3	▲ Good progress in advancing casing
Casing 49 Soil 44	9:00 to 9:20	Grey fine to med SAND trace silt.	Max 300 Min 250 Mean		3.0	▲ 8:30 - 9:00 Tightening the shackles of the hammergrab.
Casing 49 Soil 46	9:20 to 9:45	Grey fine SAND trace silt.	Max 250 Min 200 Mean		4.8	
Casing 49 Soil 43	9:45 to 10:15	"	Max 250 Min 200 Mean		4.0	
Casing 50 Soil 47	10:15 to 10:30	N/A	Max 250 Min 200 Mean		N/A	▲ Advanced casing without excavation.
N/A	10:30 to 11:40	N/A	Max Min N/A Mean		N/A	▲ Setting 4th section of casing in place. ▲ Aligned roughly and clamped. Waiting for transit to be brought in to check the alignment.
N/A	12:00 to 12:00	N/A	Max Min N/A Mean		N/A	▲ 12:00 to 12:30 Lunch break. ▲ 12:30 to 13:00 Waiting for transit
N/A	13:00 to 13:15	N/A	Max Min N/A Mean		N/A	▲ Setting up transit

Note: (1) Excavation tool: large, 2 prong hammer-grab



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 2 of 2  
Date 11/17/78  
Observer RQ SEG

D-5

INSTALLATION LOG, PILE NO. DP-1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
N/A	13:15	N/A	Max	N/A	N/A	▲ Adjusting lateral alignment by raising forward outriggers.
	to		Min			
	13:40		Mean			
N/A	13:40	N/A	Max	N/A	N/A	▲ Tack welding and remove welding clamp
	to		Min			
	13:55		Mean			
N/A	13:55	N/A	Max	N/A	N/A	▲ Check batter on casing and installation out of line by 3/8" in 4 ft. Brought into alignment by raising rear outriggers. Not necessary to remove tack weld.
	to		Min			
	14:10		Mean			
N/A	14:15	N/A	Max	N/A	N/A	▲ Welding of the 4th section of casing on progress.
	to		Min			
	17:15		Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note: a) Excavation tool: large, 2 prong hammer-grab.  
b) Two welders required for welding.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 11/13/78  
Observer R.G.

D-6

INSTALLATION LOG, PILE NO. DP-1

Batter 4 V. to 1 H.

Operating Crew: 1st shift

G.S. Elevation ±422ft

Supervisors Tricher Operators 1

Weather Cloudy

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 54 Soil 47	7:00 to 9:00	N/A	Max 300 Min 250 Mean		N/A	<ul style="list-style-type: none"> <li>More water and lens soil coming out from the hammer-grab. G. Tricher reported that casing having difficulties in advancing beyond 50 ft.</li> <li>13 ft of positive head between water inside of casing and piezo. (G.W. @ 24'4")</li> </ul>
Casing 54 Soil 47.5	9:00 to 9:45	Grey fine SAND. trace silt.	Max 300 Min 200 Mean		1.0	<ul style="list-style-type: none"> <li>Hammer grab appears to act as a hydraulic piston. May be creating negative pressure during withdrawal thus facilitating entry of soil into and up casing. Creates loss of ground.</li> </ul>
N/A	9:45 to 10:00	N/A	Max Min N/A Mean		N/A	<ul style="list-style-type: none"> <li>change 2 prong hammer-grab for 3 prong hammer-grab.</li> </ul>
Casing 54	10:00 to 10:50	Grey fine SAND. trace silt.	Max 300 Min 250 Mean			<ul style="list-style-type: none"> <li>3 prong hammer-grab occasionally got stuck in the casing.</li> <li>Getting less cutting by 3 prong hammer-grab.</li> <li>change back to 2 prong hammer-grab.</li> <li>Soil depth not measured.</li> </ul>
N/A	10:50 to 15:11	N/A	Max Min N/A Mean		N/A	<ul style="list-style-type: none"> <li>Modifying the 2 prong hammer-grab by removing the steel plate and lowering rim.</li> <li>13:30 to 13:50 pumping water into casing. A falling head permeability test then made.</li> </ul>
			Max Min Mean			<p>TIME      water level measured from top of casing</p> <p>13:55      6 ft</p> <p>13:58      6.5 ft</p> <p>14:01      6.5 ft</p> <p>14:11      6.6 ft</p> <p>14:21      6.6 ft</p>
			Max Min Mean			<ul style="list-style-type: none"> <li>14:21 to 15:11 repairing head springs of hammer-grab</li> </ul>
Casing 54 Soil 48	15:11 to 17:06	Grey fine SAND. trace silt.	Max 300 Min 250 Mean		0.5	<ul style="list-style-type: none"> <li>Hammer-grab bouncing &amp; gradually picking well.</li> <li>Cemented fine sand layer with occasional fine gravel at depth of 47 ft</li> </ul>

Note: 1) Excavation tool: Large 2 prong hammer grab  
3 prong hammer grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

D-7

P. 1 of 1  
Date 11/18-11/19/78  
Observer D. TSO

INSTALLATION LOG, PILE NO. DP-1

Batter 4 V. to 1 H.

Operating Crew: 2nd shift

G.S. Elevation ±422ft

Supervisors D. Joyce Operators 1

Weather Clear

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 54 Soil 48.3	17:00 to 20:10	Grey fine SAND trace silt	Max 350 Min 200 Mean	0 0	0.3	▲ Very low percent recovery of cuttings
Casing 54 Soil 48.7	20:10 to 21:00	"	Max Min Mean 0	  0	0.4	
N/A	21:00 to 21:30	N/A	Max Min Mean	 N/A  	N/A	▲ Lunch break.
Casing 54.5 Soil 49.9	21:30 to 0:00	Grey fine SAND trace silt.	Max 350 Min 200 Mean	  1500	0.5	▲ Very low percent recovery of cuttings ▲ Downward pressure was applied off and on yet very little advancement was achieved.
Casing 55 Soil 51.3	0:00 to 3:00	"	Max 450 Min 200 Mean	 1500  		▲ From 20:10 to 3:00, water level in the casing dropped ~ 14 ft. and mostly it was brought out by hammer-grab.
			Max Min Mean	  		
			Max Min Mean	  		
			Max Min Mean	  		

Note: 1) Excavation tool: large, 2 prong hammer-grab.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 11/20/78  
Observer R.Q.

D-8

INSTALLATION LOG, PILE NO. DP-1

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather cloudy, ~35°

Operating Crew: 1<sup>st</sup> shift

Supervisors G. Tricher Operators 2

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/min	Remarks
Casing 56 to Soil 50	7:15 to 9:20	Brown to grey fine SAND, trace silt.	Max 300 Min 250 Mean	0 0	-0.7	▲ Water level inside of casing was @ 39 ft @ 7:40. ▲ Wood fragments + black silty clay lenses recovered in the cuttings. ▲ Pin connector of the hammer-grab came loose.
			Max Min Mean			@ 8:50. Adjusting + oiling from 8:50 to 9:07. ▲ Soil level inside of casing was found to rise during excavation.
Casing 57 to Soil 49	9:20 to 11:20	Grey fine SAND, trace silt.	Max 300 Min 250 Mean	0 0	-0.5	▲ Top coupling of the hammer-grab broke @ 9:30. Fixing the coupling from 9:30 to 11:20. ▲ Excavation resumed @ 11:30 Soil level inside of casing rose during the down time. ▲ Water level was at 32.5 ft @ 11:20.
Casing 57 to Soil 50.6	11:30 to 12:00	"	Max Min Mean	N/A	3	
"	12:00 to 12:30	N/A	Max Min Mean	N/A	N/A	▲ Lunch break.
Casing 57 to Soil 50.8	12:30 to 12:50	Grey fine SAND, trace silt	Max 300 Min 250 Mean	0 0	0.6	▲ Cuttings consisted mostly of soil slurry. ▲ 40 seconds to complete one excavation cycle.
Casing 57 to Soil 53.7	12:50 to 13:20	Grey fine to med. SAND, trace silt w/ lignite fragments	Max 300 Min 250 Mean	0 0	5.8	▲ Water level in the casing @ depth of 41 ft. at 13:20. ▲ G.W.L @ 22.2 ft depth @ 13:20
Casing 57 to Soil 53.0	13:20 to 13:44	Grey fine to med. SAND, trace silt.	Max 300 Min 250 Mean	0 0	(creep in)	

Note:



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 2 of 2  
Date 11/20/78  
Observer R.O.

D-9

INSTALLATION LOG PILE NO. DP-1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 57 Soil 51	13:44 to 14:15	Grey fine to coarse sand, trace silt, trace fine to coarse gravel	Max 300 Min 250 Mean	0 0	(creep in)	
Casing 57 Soil 50	14:15 to 17:01		Max Min Mean		(creep in)	▲ Rig idle. No operation was made. ▲ 14:45 Water is 36 ft below ground surface.
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note: 1) Excavation tool: Large 2 prong hammer grab.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 11/20-11/21/78  
Observer DTSO

D-10

INSTALLATION LOG, PILE NO. DP-1

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather \_\_\_\_\_

Operating Crew: 2<sup>nd</sup> shift

Supervisors 1 Operators 1

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 57.2 Soil 50	18:55 to 20:55	N/A	Max 500 Min 200 Mean		N/A	▲ Try to push the casing without excavating inside material. Only 2 inches of advancement were achieved in two hours.
"	21:00 to 21:30	N/A	Max Min N/A Mean		N/A	▲ Coffee break.
"	21:30 to 22:00	N/A	Max Min N/A Mean		N/A	▲ Filling water storage tank.
Casing 57.2 Soil 51	22:00 to 22:30	Grey coarse SAND, trace fine gravel	Max Min Mean 0		2	▲ Decide not to refill any water into casing and watch the effect of negative water head on excavation. ▲ -11 ft of head @ 22:30.
"	22:30 to 23:00	N/A	Max Min N/A Mean		N/A	▲ Lunch break
Casing 60 Soil 55.5	23:00 to 1:15	Grey, fine to med. SAND	Max 500 Min 200 Mean		2	▲ Steady progress was maintained both in excavation + casing advancing. ▲ Water level @ 50.8 ft @ 1:15.
Casing 65 Soil 61.5	1:15 to 2:15	Grey coarse SAND, trace fine gravel	Max 500 Min 200 Mean		12	▲ Water level @ 58 ft @ 2:15.
"	2:15 to 2:45	N/A	Max Min N/A Mean			▲ At 2:15, stop operation and watch the reaction of bottom material under the 23 ft negative head.

Note:



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 2 of 2  
Date 11/20 ~ 11/21/78  
Observer D.T.S.O.

D-11

INSTALLATION LOG, PILE NO. DP-1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 65 Soil 47.9	2:15 to 2:45	N/A	Max Min Mean	N/A	(Blow in)	▲ 2:15 Soil @ 61.5' Water @ 50' 2:25 Soil @ 61.5' Water @ 41.7' 2:26 Soil @ 41.7' 2:27 Soil @ 41.7' Water @ 41.7' 2:30 Soil @ 47.9'
			Max Min Mean			▲ An obvious "blow-in" took place. ▲ Water was filled into the casing to the depth of 20 ft.
Casing 65 Soil 50.6	2:45 to 3:10	Grey coarse sand w/ fine gravel	Max 500 Min 200 Mean		3.6	
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 11/21/78  
Observer R.Q.

D-12

INSTALLATION LOG, PILE NO. DP-1

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather cloudy, ~35°

Operating Crew: 1st shift

Supervisors G. Tricher Operators 2

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 65 Soil 51.5	7:30 to 8:50	Grey, fine to coarse sand trace silt, trace fine gravel	Max 300 Min 250 Mean		0.75	▲ Water level in the casing: 23 ft @ 7:30 G.W. level @ 21.7 ft. ▲ Water level @ 33 ft @ 8:50
Casing 65.5 Soil 53.5	8:50 to 9:40	Grey, fine to coarse sand some fine to coarse gravel	Max 300 Min 250 Mean		2.4	▲ Some silty clay lumps in the cuttings
Casing 66.5 Soil 56.7	9:40 to 11:10	Grey, fine to coarse sand trace silt, some fine gravel	Max 300 Min 250 Mean		2.1	
Casing 66.5 Soil 58.	11:10 to 11:50	Grey, fine to coarse sand trace silt, trace fine gravel	Max 300 Min 250 Mean		3.5	▲ Water level at 34.5 ft @ 11:50
"	12:00 to 12:30	N/A	Max Min Mean	N/A	N/A	▲ Lunch break.
"	12:30 to 13:45	N/A	Max Min Mean	N/A	N/A	▲ Adjust the location of pump and replace its hose due to an inefficient pumping rate. ▲ Pump water into casing to 3 ft above G.W.
"	13:45 to 13:55	N/A	Max Min Mean	N/A	N/A	▲ Attempt to advance the casing but not successful. ▲ Welder asked for a shorter stick-up to make the welding of 5th section more convenient.
Casing 67.5 Soil 57.5	13:55 to 17:15	N/A	Max Min Mean		N/A	▲ Advance casing for 1 ft by pulling it up and pushing it down. ▲ 14:50. Welding the 5th section of casing on progress.

Note: (1) Excavation tool: Large, 2 prong hammer-grab.



AD-A076 096

WOODWARD-CLYDE CONSULTANTS CHICAGO IL  
RESULTS AND INTERPRETATION OF DRILLED-IN PILE TEST PROGRAM. EXI--ETC(U)  
JUL 79 J PEREZ , S F GIZIENSKI

F/G 13/2

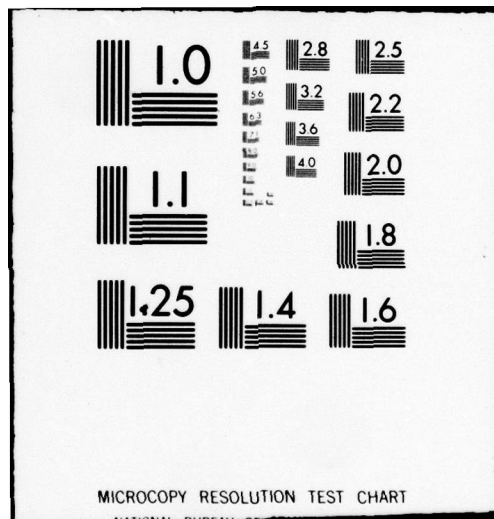
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2 OF 3  
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WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 11/21-11/22/78  
Observer D. TSO

D-13

INSTALLATION LOG, PILE NO. DP-1

Batter 4 V. to 1 H.

Operating Crew: 2<sup>nd</sup> shift

G.S. Elevation ±422ft

Supervisors 1 Operators 1

Weather \_\_\_\_\_

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 67.5 Soil 57.5	17:00 to 20:00	N/A	Max Min Mean	N/A	N/A	▲ Finish welding of the 5 <sup>th</sup> section and grind flush. ▲ Water level in the casing @ 20.3 ft @ 20:00
"	20:00 to 20:10	N/A	Max Min Mean	N/A	N/A	▲ check and make adjustment to get proper alignment of the casing.
Casing 68 Soil 59.1	20:10 to 22:30	Grey. fine to coarse SAND. trace fine gravel, lignite & wood fragments	Max 500 Min 200 Mean		0.7	▲ Water level in the casing @ 26.9 ft @ 22:30
"	22:30 to 23:10	N/A	Max Min Mean	N/A	N/A	▲ Coffee break.
"	23:10 to 3:30	N/A	Max Min Mean	N/A	N/A	▲ Water level in the casing was 29.4 ft @ 23:10. ▲ Rig broke down due to the malfunction of the hammer-grab @ 23:10. NO section was available to check it.
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note: (1) Excavation tool: Large, 2 prong hammer-grab.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 11/22/78  
Observer R.Q.

D-14

INSTALLATION LOG, PILE NO. DP-1

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather cloudy, ~35°

Operating Crew: 1st Shift

Supervisors G. Tricher Operators 2

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 68 Soil 59.1	7:18 to 9:45	N/A	Max Min Mean	N/A	N/A	▲ Replace the broken and jammed wire rope in the hammer-grab. ▲ G.W.L @ 24.75 ft @ 7:20 ▲ 9:00 to 9:45 Hook up the hose line which runs between the river & the water tank and fill up the tank. ▲ 11:00 water level in the casing @ 26 ft.
Casing 69 Soil 60	9:45 to 11:01	Grey. fine to coarse SAND. trace silt	Max 300 Min 250 Mean		0.7	
Casing 69 Soil 60.5	11:02 to 13:15	Grey. fine to coarse SAND. trace silt, some fine gravel	Max Min Mean 200		0.3	▲ Low percentage recovery of the cuttings ▲ Lunch break between 12:00 to 12:30
Casing 69 Soil 62	13:15 to 14:25	Grey. fine to coarse SAND. trace silt, some fine gravel.	Max 250 Min 200 Mean		1.3	▲ 13:15 water level in the casing @ 21 ft. ▲ 14:25 water level in the casing @ 24 ft.
Casing 69 Soil 62.7	14:25 to 15:40	"	Max 250 Min 200 Mean		0.6	▲ Recovered cuttings consisted mostly of water.
" to 16:30	15:40 to 16:30	N/A	Max Min Mean	N/A	N/A	▲ Two springs of the shock absorbers of the hammer-grab broke. Replacing new springs in progress.
			Max Min Mean			
			Max Min Mean			

Note: 1) Excavation tool: Large, 2 prong hammer-grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1 **D-15**  
Date 11/22-11/23/76  
Observer D. TSO

INSTALLATION LOG FILE NO. OP-1

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather Rainy

Operating Crew:

Supervisors 1 Operators 1

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 69	17:00	N/A	Max		N/A	▲ Install new springs of the shock absorbers.
Soil	to		Min	N/A		▲ Water level in the casing was about 6 ft below the top of the casing @ 18:10.
62.7	18:10		Mean			
"	18:10	N/A	Max		N/A	▲ Pump water out of the casing.
to			Min	N/A		Water level was lowered to 15 ft below the top of the casing.
20:00			Mean			
"	20:00	N/A	Max		N/A	▲ Carpenters made an extra piece of top cover for the operator so that discharged water from the hammer-grab won't split onto his face.
to			Min	N/A		
22:00			Mean			
Casing 69	22:00	Grey, fine to coarse SAND trace fine gravel.	Max 500		0.2	▲ Cuttings consisted mostly of water.
Soil	to		Min 200			
62.8	22:30		Mean	0		
"	22:30	N/A	Max		N/A	▲ Lunch break.
to			Min	N/A		
23:00			Mean			
"	23:00	N/A	Max		N/A	▲ The hammer-grab dropped out of its carrier while discharging the cuttings due to some problems of the brake
to			Min	N/A		▲ The hammer-grab was put back to position at 1:20.
1:20			Mean			
"	1:20	N/A	Max		N/A	▲ Lunch break.
to			Min	N/A		
2:05			Mean			
Casing 69	2:05	Grey, fine to coarse SAND, trace fine gravel	Max 500		0.6	
Soil	to		Min 200			
63.1	3:00		Mean	0		

Note: (1) Excavation tool: Large, 2 prong hammer-grab.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 11/24/78  
Observer R.Q.

D-16

INSTALLATION LOG FILE NO. DP-1

Batter 4 V. to 1 H.

Operating Crew: 1st shift

S.S. Elevation ±422ft

Supervisors G. Tricher Operators 2

Weather Partly cloudy, ~ 55°

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 69 Soil 62.7	7:19 to 8:45	Grey, fine to coarse SAND, trace silt.	Max 250 Min 200 Mean			▲ 7:19. Water level in the casing was @ G.S. ▲ G.W.L @ 22 ft
"	8:45 to 9:15	N/A	Max Min N/A Mean		N/A	▲ Repair the broken springs of the shock absorber of the hammer-grab.
Casing 69 Soil 63.1	9:15 to 10:00	Grey, fine to coarse SAND, trace silt, trace fine gravel	Max 250 Min 200 Mean		0.8	▲ Cuttings consisted of 80% water and 20% soil. ▲ 10:00 water level in the casing @ 9 ft below
"	10:00 to 10:30	N/A	Max Min N/A Mean		N/A	▲ Move the spout toward South so that cuttings can be discharged on different area.
Casing 69 Soil 64.5	10:30 to 11:40	Grey, fine to coarse SAND, trace silt, trace fine gravel.	Max 250 Min 200 Mean		2.4	▲ 10:40 to 10:50 Hammer grab was jammed in the guide carrier because the operator failed to brake in time.
"	12:00 to 12:30	N/A	Max Min N/A Mean		N/A	▲ Lunch break
Casing 69 Soil 65	12:30 to 13:30	Grey, fine to coarse SAND, trace silt, trace fine gravel.	Max 250 Min 200 Mean		0.5	▲ 13:30 Water level in the casing is 16 ft below ground surface
"	13:30 to 16:00	N/A	Max Min N/A Mean		N/A	▲ Hammer grab was jammed in the guide carrier. Repair work in progress

Note:



WOODWARD-CLYDE CONSULTANTS  
 LOCKS AND DAM NO. 28  
 DRILLED-IN PILE TEST

P. 2 of 2  
 Date 11/24/78  
 Observer R.Q.

D-17

INSTALLATION LOG, PILE NO. DP-1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 69 Soil 65.5	16:00 to 17:15	Grey, fine to coarse sand, trace silt, some coarse gravel.	Max 250 Min 200 Mean	0	0.4	▲ 17:15 Water level in the casing was 18 ft below G.S.
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 11/24-11/25/78  
Observer D. ISO

D-18

INSTALLATION LOG, PILE NO. DP-1

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather \_\_\_\_\_

Operating Crew: 2nd shift

Supervisors 1 Operators 1

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 70 Soil 66.2	18:00 +0 20:00	Grey fine to coarse sand, some fine gravel.	Max 500 Min 200 Mean		0.3	▲ 18:00 Soil in the casing @ 65.6 ft below ground surface. Water level @ 17.9 ft below G.S. ▲ 20:00 Soil @ 66.2 ft below G.S. Water level @ 24.9 ft below G.S.
Casing 71 Soil 67.2	20:00 +0 21:00	"	Max 500 Min 200 Mean		1.0	▲ 21:00 Water level in the casing was @ 28.2 ft below G.S.
"	21:00 +0 21:30	N/A	Max Min N/A Mean		N/A	▲ Coffee break.
Casing 72.8 Soil 70	21:30 +0 1:30	Grey, fine to coarse sand, some fine gravel.	Max 500 Min 200 Mean		0.75	▲ 1:30 Soil in the casing @ 70 ft below ground surface. Water level @ 33.8 ft below G.S.
"	1:30 +0 2:00	N/A	Max Min N/A Mean		N/A	▲ Lunch break.
Casing 73 Soil 70	2:00 +0 2:45	Grey, fine to coarse sand, trace silt, some fine gravel.	Max 500 Min 200 Mean		1.0	▲ 2:00 Soil in the casing @ 69.5 ft below ground surface. About 6 in. higher than it was @ 1:30. Water level @ 34.3 ft below G.S.
			Max Min Mean			▲ 2:30 One chain of the chain-assembly broke. Crew knocked off @ 2:45.
			Max Min Mean			

Note (1) Excavation tool: Large, two prong hammer grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1 D-19  
Date 11/25/78  
Observer R.Q.

INSTALLATION LOG PILE NO. DP-1

Batter 4 V. to 1 H.

Operating Crew: 1st shift.

S.S. Elevation ±422ft

Supervisors Tricher Operators 1

Weather \_\_\_\_\_

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 73 Soil 70	7:30 to 8:45	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>▲ Repair work for the broken chain in progress.</li> <li>▲ 7:30 Water level in the casing was @ 24 ft below G.S.</li> <li>▲ Ground water level @ 22 ft below G.S.</li> </ul>
Casing 73.5 Soil 71.3	8:45 to 9:30	Grey, fine to coarse sand trace silt, some fine gravel.	Max 300 Min 250 Mean		1.7	<ul style="list-style-type: none"> <li>▲ 8:15 Pump water into casing and raise water level to 21 ft below G.S.</li> <li>▲ 9:30 Water level in the casing was @ 24.5 ft below G.S.</li> </ul>
"	9:30 to 11:25	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>▲ 9:30 the clamps got loose and could not hold the casing in the semi-rotary movement.</li> <li>▲ Repair work in progress.</li> </ul>
Casing 74 Soil 70	11:25 to 13:00	Grey, fine to coarse sand trace silt, some fine to coarse gravel.	Max 250 Min 200 Mean			<ul style="list-style-type: none"> <li>▲ It was found that outside soil crept into the casing.</li> <li>▲ 12:00 to 12:30 Lunch break.</li> <li>▲ 13:00 Water level in the casing @ 24 ft below ground surface.</li> </ul>
Casing 74.5 Soil 70.5	13:00 to 14:35	Grey, fine to coarse sand trace silt, some fine gravel.	Max 300 Min 200 Mean		0.4	<ul style="list-style-type: none"> <li>▲ 13:00 Water was pumped into the casing.</li> <li>▲ 13:05 Water level in the casing @ 19 ft below the ground surface.</li> <li>▲ 14:15 Water level @ 22.5 ft below G.S.</li> <li>▲ 14:30 Some more water is pumped into the casing and water level @ 19.5 ft below G.S.</li> </ul>
"	14:35 to 17:30	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>▲ 14:35 No soil recovered in the hammer grab. It was then found that the pin connector of the grab arm was broken.</li> </ul>
			Max Min Mean			<ul style="list-style-type: none"> <li>▲ Repair work in progress</li> </ul>
			Max Min Mean			

Note: (1) Excavation tool: Large two prong hammer grab.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 12/12/78  
Observer R.Q.

D-20

INSTALLATION LOG, PILE NO. DP-1

Batter 4 V. to 1 H.

Operating Crew: 1st Shift

G.S. Elevation ±422ft

Supervisors Tricker, Azim Operators 2

Weather Clear 40°-50°

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 74.5 Soil 69	7:30 to 10:15	N/A	Max Min Mean	N/A	N/A	▲ Anchor the rig to the concrete mat.
Casing 75 Soil 71	10:15 to 12:45	Grey, fine to coarse SAND, trace silt, trace fine gravel.	Max 250 Min 200 Mean		(1)  1.0	▲ 10:30 Water level in the casing was 25 ft below ground surface ▲ 10:30 Ground water level is 25 ft below ground surface ▲ 12:00 to 12:30 Lunch break.
Casing 75 Soil 71.4	12:45 to 14:05	Grey, fine to medium SAND, trace silt.	Max 250 Min 200 Mean		(2)  0.4	▲ 13:30 to 13:50 Replace the small hammer grab with the large one. ▲ 14:05 Water level in the casing is 21 ft below ground surface
Casing 75 Soil 72.5	14:05 to 15:16	Grey, fine to coarse SAND, trace silt, some fine gravel.	Max 250 Min 200 Mean		0.9	▲ No progress achieved in casing advance- ment. ▲ 15:16 Water level in the casing is 22.5 ft below ground surface.
Casing 75 Soil 73	15:16 to 16:15	Grey, fine to medium SAND, trace silt, trace fine gravel.	Max Min Mean 0		0.5	▲ 16:15 Water level in the casing is 23.6 ft below ground surface.
Casing 75 Soil 73.5	16:15 to 17:10	Grey, fine SAND trace silt.	Max Min Mean 0		0.5	▲ 16:50 Pump water into the casing and raise water level to 20 ft below G.S.
			Max Min Mean			
			Max Min Mean			

Note:  
(1) Excavation tool: Small, two prong hammer grab  
(2) Excavation tool: Large, two prong hammer grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 12/13/78  
Observer R.Q.

D-21

INSTALLATION LOG FILE NO. DP-1

Batter 4 V. to 1 H.

Operating Crew: 1st shift

G.S. Elevation ±422ft

Supervisors Tricher Operators 1

Weather clear, ~40°

Laborers 1 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 76 Soil 73.8	7:30 to 8:15	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>Modified longer anchor bolts were installed to the rig + concrete mat.</li> <li>7:30 water level in the casing is 23 ft below G.S.</li> <li>Ground water level is 25.4 ft below G.S.</li> </ul>
Casing 77 Soil 75	8:15 to 9:00	Grey, fine to medium sand trace silt, trace fine gravel.	Max Min Mean 250	1500	1.7	<ul style="list-style-type: none"> <li>9:00 water was pumped into casing and raised water level to 23 ft below G.S.</li> </ul>
Casing 78 Soil 75.4	9:00 to 10:20	Grey, fine sand trace silt.	Max Min Mean 0	0	0.4	<ul style="list-style-type: none"> <li>Pump water into the casing between 10:10 and 10:20.</li> </ul>
Casing 78 Soil 76	10:20 to 11:25	"	Max Min Mean 500	0	0.5	<ul style="list-style-type: none"> <li>Water level in the casing is 23.4 ft below ground surface.</li> </ul>
Casing 78 Soil 76	11:25 to 12:45	Grey, fine sand trace silt.	Max Min Mean 0	0	0.	<ul style="list-style-type: none"> <li>11:45 water level is 26.5 ft below ground surface.</li> <li>12:00 to 12:30 Lunch break.</li> </ul>
Casing 78 Soil 77.5	12:45 to 14:00	Grey, fine sand trace silt.	Max Min Mean 0	0	1.5	<ul style="list-style-type: none"> <li>12:45 to 13:00 pump water into the casing and raise water level to 25.5 ft below ground surface.</li> </ul>
Casing 78 Soil 77.5	14:00 to 14:30	Grey fine sand trace silt	Max Min Mean 0	0	0	<ul style="list-style-type: none"> <li>Water level in the casing is 23 ft below ground surface.</li> <li>It takes about 2 min. to make a complete excavation cycle.</li> </ul>
Casing 78.5 Soil	14:30 to 14:55	N/A	Max 250 Min 250 Mean 250	1500	N/A	<ul style="list-style-type: none"> <li>Advance casing for 0.5 ft.</li> <li>Soil depth is not measured</li> </ul>

Note: (1) Excavation tool: small, 2 prong hammer-grab

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 12/13-12/14/78  
Observer D. Tso

D-22

INSTALLATION LOG, PILE NO. OP-1

Batter 4 V. to 1 H.

Operating Crew: 2<sup>nd</sup> shift

G.S. Elevation ±422ft

Supervisors 1 Operators 1

Weather clear, 20°-30°

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 83 Soil	19:40 to 19:50	N/A	Max 500 Min 400 Mean		N/A	▲ Advance casing from 81' to 83' ▲ ICOS limits the casing advancement within 2 ft so that only a small amount of soil will be compacted during excavation
Casing 83 Soil 81.5	19:50 to 21:00	Grey, fine SAND. trace silt.	Max Min N/A Mean		0.5	▲ 20:50 Pump water into the casing and raise its level to 15.2" below ground surface.
"	21:00 to 21:30	N/A	Max Min N/A Mean		N/A	▲ Coffee break.
Casing 83 Soil 82.9	21:30 to 22:50	Grey fine SAND. trace silt. Some coarse sand + gravel	Max Min N/A Mean		1.1	▲ 22:40 Water level in the casing is @ 19.5'. It is then raised to 15.5" by adding more water in. ▲ Coarse sand + fine gravel appeared in the cutting @ 22:35.
Casing 84.5 Soil 82.9	22:50 to 22:55	N/A	Max 500 Min 400 Mean		N/A	▲ Advance the casing for 1.5 ft.
Casing 84.5 Soil 84.2	22:55 to 23:45	Coarse SAND + fine gravel	Max Min N/A Mean		1.7	▲ 23:40 Water level in the casing is @ 25 ft below ground surface. It is then raised to 12 ft below ground surface by adding water into casing
Casing 85.5 Soil 84.2	23:45 to 23:55	N/A	Max 500 Min 400 Mean		N/A	▲ Advance the casing for 1 ft. ▲ The cherry picker is not available until 2:10. (It is working in Rock Anchor test area).
"	23:55 to 2:45	N/A	Max Min N/A Mean		N/A	▲ 2:25 The 6 <sup>th</sup> section of the casing is moved to the side of Benoto. No welder is scheduled for tonight, so the welding is left for tomorrow.

Note: (1) Excavation tool: Small, 2 prong hammer-grab



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 12/14/78  
Observer R. Q.

D-23

INSTALLATION LOG, PILE NO. DP-1

Batter 4 V. to 1 H.

Operating Crew: 1st shift

G.S. Elevation ±422ft

Supervisors G. Tricher Operators 2

Weather Clear, 30°-45°

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 85.5 Soil 82.6	7:20 to 13:30	N/A	Max Min Mean	N/A	N/A	▲ 7:20 Water level in the casing is @ 12 ft below ground surface ▲ Ground water level is @ 25 ft below ground surface.
			Max Min Mean			▲ 7:20 to 13:30 (include lunch time from 12:00 to 12:30) Weld the 6 <sup>th</sup> section of the casing and grind flush.
Casing 87 Soil 84	13:30 to 13:45	N/A	Max Min Mean		N/A	▲ Water level in the casing is @ 13 ft below ground surface. ▲ Advance casing from 85.5 ft to 87 ft.
Casing 89 Soil 85.7	13:45 to 14:35	Grey. fine to coarse SAND, trace silt, some fine to coarse gravel	Max Min Mean		2.0	▲ Water level in the casing is @ 22 ft below ground surface.
Casing 90 Soil 87	14:35 to 16:00	Grey med. to coarse SAND, some fine to coarse SAND	Max Min Mean	N/A	0.9	▲ 16:00 Water level is @ 18 ft below ground surface.
Casing 90 Soil 88	16:00 to 17:30	"	Max Min Mean	N/A	1.0	▲ 17:30 Water level in the casing is @ 26 ft below ground surface
			Max Min Mean			
			Max Min Mean			

Note: (1) Excavation tool: Large, 2 prong hammer-grab.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 12/14 - 12/15/78  
Observer D.TSO

D-24

INSTALLATION LOG, PILE NO. DP-1

Batter 4 V. to 1 H.

Operating Crew: 2nd shift

G.S. Elevation ±422ft

Supervisors 1 Operators 1

Weather Clear, 30°-30°

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 92	18:00	Grey, med. to coarse sand	Max 400	1350	1.4	▲ 19:10 Water level in the casing is @ 0 ft below ground surface
Soil	to	trace silt	Min 450	1300		
89.4	19:10	some fine to coarse gravel	Mean			
Casing 92	19:10	N/A	Max		N/A	▲ The hammer-grab fell off from the guide carrier. It was put back @ 19:40
Soil	to		Min	N/A		
89.4	19:40		Mean			
Casing 93	19:40	Grey coarse sand, some	Max 450	1300	1.8	▲ 20:30 Water level is @ 10.8 ft below ground surface.
Soil	to	fine to coarse gravel.	Min 400	1350		
91.5	21:00		Mean			
"	21:00	N/A	Max		N/A	▲ Coffee break.
to			Min	N/A		
21:30			Mean			
Casing 96	21:30	Grey coarse sand, some	Max 450	1350	2.1	▲ Water level in the casing is higher than ground water level
Soil	to	fine to coarse gravel.	Min 400	1300		
94	22:40		Mean			
Casing 96	22:40	"	Max		1.0	
Soil	to		Min	N/A		
95.3	0:00		Mean			
Casing 98	0:00	"	Max 450	1300	0.1	▲ Advance casing from 96 ft to 97' at 0:10. and from 97' to 98' at 0:20 ▲ Although tape measurement showed that excavation progress is only 1" between 0:00 and 1:00. it was noticed that the cuttings retained in the bin was much more than this amount.
Soil	to		Min 400	1400		
95.4	1:00		Mean			
			Max			
			Min			
			Mean			

Note:



WOODWARD-CLYDE CONSULTANTS  
 LOGS AND DAM NO. 28  
 DRILLED-IN PILE TEST

P. 2 of 2  
 Date 12/14 - 12/15/78  
 Observer D. TSO

D-25

INSTALLATION LOG, PILE NO. DP-1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 99.7 Soil 94.5	1:00 to 1:30	N/A	Max 600 Min 500 Mean	1500  1400	N/A	<ul style="list-style-type: none"> <li>Advance casing from 98' to 99.7' @ 1:00</li> <li>The last 8" was made w/ some difficulty.</li> <li>Water level in the casing is 11 ft below ground surface @ 1:20.</li> </ul>
"	1:30 to 2:15	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>1:20 Soil depth is measured at 94.5'</li> </ul>
Casing 99.7 Soil 96.7	2:15 to 2:50	Grey med. to coarse SAND some fine to coarse gravel.	Max Min Mean	N/A	3.8	<ul style="list-style-type: none"> <li>Ground water level is at 25'3" below ground surface.</li> <li>2:50 water pump broke down. Water level in the casing is @ 24 ft below ground surface.</li> </ul>
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note: 1) Excavation tool: Large 2 prong hammer grab.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 12/15/78  
Observer R. Q.

D-26

INSTALLATION LOG, PILE NO. DP-1

Batter 4 V. to 1 H.

Operating Crew: 1<sup>st</sup> shift

G.S. Elevation ±422ft

Supervisors G. Tricher Operators 2

Weather Clear, 30°~48°

Laborers 2 Others 1

Depth, ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 99.7	7:15	N/A	Max	N/A	N/A	▲ Ground water @ 25.3 ft below ground surface.
to			Min			▲ 7:15 Water level in the casing is @ 25.4 ft below ground surface. It raises to 10 ft below ground surface by adding water in.
Soil 96.7	7:35		Mean			
Casing 101	7:35	Grey, fine to coarse sand trace silt. some fine to coarse gravel.	Max 500	1300	0.3	▲ 8:45 Water level in the casing is @ 11 ft below ground surface
to			Min 450			
Soil 97	8:45		Mean			
Casing 102	8:45	"	Max 500	1300		▲ 9:00 Advance casing from 101 ft to 102 ft.
to			Min 450			▲ 9:15 to 9:30 Convert into small hammer grab.
Soil	9:30		Mean			▲ 9:30 Pull the casing up for 2 ft. 2:25 field engineer thinks that in this way he can enhance the excavation rate.
Casing 100	9:30	Grey, fine to coarse sand trace silt. some fine gravel.	Max	N/A	1.0	▲ 10:35 Water level in the casing is 26 ft below ground surface. It raises to 14 ft after adding more water in.
to			Min			
Soil 98	10:35		Mean			
Casing 100	10:35	Grey fine to coarse sand trace silt. trace fine gravel.	Max	N/A	0.6	▲ 11:06 Water level in the casing is @ 21 ft below ground surface.
to			Min			
Soil 98.3	11:06		Mean			
Casing 102.5	11:06	Grey fine to coarse sand trace silt. some fine to coarse gravel.	Max	1300	1.75	▲ 11:30 Water level in the casing is @ 22 ft below ground surface. It raises to 13.5 ft after adding water in.
to			Min			
Soil 99	11:30		Mean 500			
Casing 101	11:30	"	Max 500	0	1.0	▲ Pull the casing back up to 101 ft at 13:15.
to			Min 450			▲ 13:15 Water level in the casing is @ 14 ft below ground surface.
Soil 99.5	13:15		Mean			▲ 12:00 to 12:30 Lunch break.
Casing 104	13:15	"	Max 250	1300	0.	▲ Normal excavation makes no progress!
to			Min 200			▲ 14:30 Convert into Large hammer-grab. Water level is @ 20 ft below ground surface.
Soil 99.5	14:30		Mean			▲ Welding of the 7 <sup>th</sup> section on progress.

Note: 1. Excavation tool: Large 2 prong hammer grab was converted into the small one at 9:15 It was converted back at 14:30.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 12/15-12/16/78  
Observer D. TSO

D-27

INSTALLATION LOG, PILE NO. DP-1

Batter 4 V. to 1 H.  
G.S. Elevation ±422ft  
Weather \_\_\_\_\_

Operating Crew: 2nd shift  
Supervisors 1 Operators 1  
Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 104.3 Soil 102	19:00 to 21:00	Grey fine to coarse SAND. some fine to coarse gravel.	Max 700 Min 600 Mean	1400	1.3	▲ 19:00 Soil @ 99'6" ▲ 19:25 Soil @ 100'9" ▲ 20:40 Advance casing from 104' to 104'4" ▲ 20:55 Soil @ 102'
Casing 104.3 Soil 100	21:00 to 21:35	N/A	Max Min N/A Mean	N/A	N/A	▲ Coffee break. ▲ 21:35 Soil @ 100' (102' @ 20:55)
Casing 107 Soil 104.3	21:35 to 1:30	Grey, fine to coarse SAND. some fine to coarse gravel.	Max 700 Min 600 Mean	1400	1.2	▲ 22:00 Advance casing from 104'4" to 105'8" ▲ 23:15 Soil @ 103' ▲ 23:20 Advance casing from 105'8" to 105' ▲ 0:07 A lot of coarse gravel noted in the cutting.
"	1:30 to 2:00	N/A	Max Min N/A Mean	N/A	N/A	▲ 0:40 Advance casing from 106' to 107' ▲ Lunch break.
Casing 107 Soil 105.9	2:00 to 3:00	Grey fine to coarse SAND. some fine to med gravel.	Max Min N/A Mean	N/A	2.1	▲ 2:45 Soil @ 104'3" ▲ 3:05 Soil @ 105'11" ▲ 3:05 Ground water level is @ ±5.2' below ground surface.
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

NOTE: (1) Excavation tool: Large 2 prong hammer grab.  
(2) Advancing casing w/ difficulty. The concrete mat was lifted up while pushing  
down the casing.

WCC. Y7C928. Phase IV

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 12/16/78  
Observer R.G.

D-28

INSTALLATION LOG, FILE NO. DP-1

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather Clear, 30°-45°

Operating Crew: 1st shift

Supervisors prichico Operators 2

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 107 Soil 105	7:15	N/A	Max Min Mean	N/A	N/A	▲ Water level in the casing @ 10ft below ground surface
Casing 107 to Soil 106.3	7:15 to 8:45	Grey, fine to coarse sand, trace silt, trace fine to coarse gravel.	Max Min Mean	N/A	0.9	▲ Pump water into casing. Water level @ 7 ft below ground surface.
Casing 108 Soil	8:45 to 9:10	"	Max 500 Min 300 Mean	1300 1350	N/A	▲ Advance casing from 107' to 108' ▲ Soil depth is not measured.
Casing 109 Soil	9:10 to 10:30	" w/ occasional cobbles.	Max 500 Min 300 Mean	1300		▲ Add water into the casing. ▲ Soil depth is not measured. ▲ Advance casing from 108' to 109'.
Casing 110 Soil 107.5	10:30 to 11:45	"	Max 500 Min 300 Mean	1300		▲ 11:40 Advance casing to 110 ft. ▲ Pump water into the casing. Water level @ 11 ft below ground surface.
Casing 110 Soil 107.6	11:45 to 14:00	Grey, fine to coarse sand, trace silt, some fine gravel.	Max 500 Min 400 Mean	0	0	▲ 12:00 to 12:30 Lunch break. ▲ Practically, no soil is recovered from the large hammer grab. Convert to small hammer grab at 14:00. ▲ Water level in the casing @ 22 ft below G.S.
Casing 110.6 to Soil 108.1	14:00 to 15:00	Grey, fine to coarse sand, trace silt, trace fine gravel.	Max Min Mean	1.5	1.5	▲ Water level in the casing @ 24 ft below ground surface ▲ It is noted that when the hammer grab is pulled up slowly, better recovery is obtained.
Casing 113 Soil 110.1	15:00 to 17:30	"	Max 500 Min 300 Mean	1300	1.5	▲ Water level in the casing @ 26 ft Add water in at 16:30. ▲ 17:30 Water level @ 16 ft below ground surface.

Note:



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 2 of 2  
Date 12/16/78  
Observer R.Q.

D-29

INSTALLATION LOG, PILE NO. DP-1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 113 Soil 111	17:30 to 18:30	Grey. fine to med. sand trace silt. trace fine gravel.	Max 500 Min Mean		0.9	▲ Water level in the casing @ 12 ft below ground surface.
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab is converted into small one  
at 14:00.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 12/16 ~ 12/17/78  
Observer D. TSO

D-30

INSTALLATION LOG, PILE NO. DD-1

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather clear, ~20°

Operating Crew: 2<sup>nd</sup> shift

Supervisors 1 Operators 1

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 114	18:30	Grey, fine to med. SAND	Max		0.4	▲ Low percentage of recovery. ▲ Advancing casing w/ difficulty ▲ 18:30 Soil @ 111'. 20:30 Soil @ 112'.
to Soil		trace silt.	Min			
112	21:00	trace fine to med. gravel	Mean 900	1350		
"	21:00		Max		N/A	▲ Coffee break.
to		N/A	Min	N/A		
21:30			Mean			
Casing 115.5	21:30	Grey, fine to med. SAND	Max		0.4	▲ Low percentage of recovery. ▲ 22:00 clayey silt bits are noted in the cutting w/ about 1" thickness ▲ 22:30 Advance casing from 114' to 115'
to Soil		trace coarse sand, trace	Min			
113.5	1:30	fine to med. gravel	Mean 900	1350		
			Max			▲ 0:50 Soil @ 112' 10" ▲ 0:55 Advance casing from 115' to 115' 6" ▲ 1:30 Soil @ 113' 6"
			Min			
			Mean			
"	1:30		Max		N/A	▲ Lunch break.
to		N/A	Min	N/A		
2:00			Mean			
Casing 116.5	2:00	Grey fine to med. SAND	Max		1.5	▲ Clayey silt bits are noted in the cutting w/ about 1/2" thickness. ▲ 2:20 Soil @ 114' 6" ▲ 2:25 Advance casing from 115.5' to 116' ▲ 3:05 Soil @ 115'
to Soil		trace silt.	Min			
115	3:00	trace coarse SAND, trace fine to med. gravel	Mean 950	1400		
			Max			▲ 3:10 Advance casing from 116' to 116.5' ▲ 3:15 Ground water @ 25' 1" below ground surface.
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note: (1) Excavation tool: Small 2 prong hammer grab.

(2) 19:30 to 24:00 only 4" soil was removed thru. excavation, but the cuttings retained in the bin showed a much greater amount (about 1.5 ft)



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 12/18/78  
Observer RQ/SFG

D-31

INSTALLATION LOG, FILE NO. DD-1

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather Clear to partly cloudy, 30°-48°

Operating Crew: 1st shift

Supervisors Presicio Operators 2

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 116.5	7:15	Grey, fine to coarse sand	Max			▲ Ground water table @ 25.2 ft.
Soil	to	trace silt, some fine to coarse gravel	Min	N/A	1.4	▲ Water level in the casing @ 12 ft below ground surface at 7:15. Pump water into casing and raise its level to the ground surface.
	10:00		Mean			
Casing 116.5	10:00	N/A	Max			▲ Very hard to rotate casing. Slipping between the casing + casing guide jaws.
Soil	to		Min	N/A	N/A	▲ Weld the jaws to casing.
	11:34		Mean			▲ Soil is measured @ 115'1"
Casing 116.5	11:34	Grey, coarse sand w/ gravel	Max			▲ 11:34 Water level @ 8'6" below G.S.
Soil	to		Min	N/A	5	▲ Free fall + withdrawing slowly of the hammer grab.
	11:47		Mean			▲ Occasionally grab jaws not fully closed due to large gravel. Loses material when not fully closed.
"	11:47	N/A	Max			▲ 11:47 Water level @ 19'2" below G.S.
	to		Min	N/A	N/A	▲ Ground water table @ ~25'
	12:40		Mean			▲ Lunch break.
Casing 116.5	12:40	Grey, coarse sand w/ gravel	Max			▲ 12:40 Soil depth is measured @ 115'8"
Soil	to		Min	N/A	3.3	▲ 12:40 Add water into casing Water level @ 12' below G.S.
	13:05		Mean			▲ 13:05 Water level in the casing @ 14' below G.S.
Casing 118	13:05	N/A	Max			▲ 13:05 Raise casing guide jaws and weld to casing to prevent slipping
Soil	to		Min		N/A	▲ Excavation resumed @ 13:25
	13:25		Mean			
Casing 118.5	13:25	Grey, coarse sand w/ gravel	Max			▲ 13:46 Water level @ 30'. (It's too low. Water escaped during welding and water removed during digging. Soil probably coming in during digging due to head difference.)
Soil	to		Min		0.9	
	13:46		Mean			
Casing 119	13:46	Grey, coarse sand & gravel	Max			▲ 13:51 Water added into casing to the level of 4' below G.S.
Soil	to		Min		1.12	▲ 13:51 to 14:30 Raise casing guide jaws and reweld them to the casing
	15:53		Mean			

Notes

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 2 of 2  
Date 12/18/78  
Observer SFG

D-32

INSTALLATION LOG, PILE NO. DP-1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 120.5 Soil 119.8	15:53 to 16:36	Grey, coarse sand + gravel to 4" $\phi$ .	Max Min Mean		2.1	<ul style="list-style-type: none"> <li>15:58 Water level in the casing @ 14 ft below ground surface. Water is added in.</li> <li>Hammer grab pre fall at about 12 ft/sec.</li> <li>Complete cycle: 1 min. 40 sec.</li> <li>Adding water continuously.</li> </ul>
Casing 121.3 Soil 119.6	16:38 to 17:25	"	Max Min Mean		N/A	<ul style="list-style-type: none"> <li>16:42 Advance casing to 121'4".</li> <li>Oscillating OK.</li> <li>Set up 8th section of casing @ 16:45.</li> <li>17:10 Water level in the casing @ 14 ft below G.S.</li> <li>Welding started @ 17:25.</li> </ul>
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note: (1) Excavation tool: Small 2 prong hammer grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 12/18-12/19/78  
Observer D. Tso

INSTALLATION LOG, PILE NO. DP-1

Batter 4 V. to 1 H.

C.S. Elevation ±422ft

Weather \_\_\_\_\_

Operating Crew: 2nd shift

Supervisors 1 Operators 1

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 121.3 Soil 119.6	17:30 to 21:00	N/A	Max Min Mean	N/A	N/A	▲ Weld the 8th section of the casing + grind flush.
"	21:00 to 21:30	N/A	Max Min Mean	N/A	N/A	▲ Coffee break.
Casing 122.5 Soil 121.5	21:30 to 23:15	Grey, med. to coarse SAND, some fine to coarse gravel.	Max Min Mean 900	1400	1.3	▲ 21:30 Soil @ 119' ▲ 22:10 Soil @ 120' ▲ 22:15 Advance casing to 122' ▲ 23:00 Soil @ 121' ▲ 23:10 Advance casing to 122.5'
Casing 123.5 Soil 122.2	23:15 to 1:00	"	Max Min Mean 900	1400	0.8	▲ 0:00 Soil @ 122'3" ▲ 0:10 Advance casing from 122.5' to 123.5'
"	1:00 to 1:30	N/A	Max Min Mean	N/A	N/A	▲ Lunch break.
"	1:30 to 2:40	N/A	Max Min Mean	N/A	N/A	▲ Reweld the jaws of the casing guide to the casing.
Casing 124 Soil 122.7	2:40 to 3:00	Grey, med. to coarse SAND some med. to coarse gravel	Max Min Mean 900	1400	1.4	▲ 3:00 Advance casing from 123.5' to 124' the reciprocating twist broke all the weld. ▲ 3:10 Soil @ 122'8" Water level @ 2' above ground surface.
			Max Min Mean			

Note (1) Excavation tool: Small, 2 prong hammer grab.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 12/19/78  
Observer RR / SEG

D-34

INSTALLATION LOG, PILE NO. DD-1

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather Chilly

Operating Crew: 1st shift

Supervisors Persico Operators 1

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 126 Soil 123	7:30 to 9:40	N/A	Max 1000 Min 500 Mean		N/A	▲ 7:30 Water level in the casing @ 6' below G.S. ▲ 7:30-9:00 Weld gripping mechanism. ▲ 9:00 to 9:30 Advance casing from 124' to 126' ▲ 9:30 Water level in the casing @ 4' above G.S. ▲ Ground water table @ 25' below G.S.
Casing 126 Soil 124	9:40 to 10:47	Grey med. SAND. some gravel	Max Min N/A Mean		1.0	▲ 10:12 Water level in the casing @ 7' below G.S. ▲ Attempt to advance the casing. Grippers not gripping properly and casing does not rotate in the ground. To advance casing, it is necessary to excavate to about 1 to 2 ft from tip casing. ▲ 10:48 Water level in the casing @ ground surface. ▲ A complete excavation cycle takes 2 min. 10 sec.
			Max Min Mean			
Casing 127 Soil 124	10:47 to 11:30	Grey brown med. to coarse SAND. some gravels.	Max 1000 Min 200 Mean 600		0.	▲ 38 min. of excavation makes no progress. (Soil comes up?) ▲ 11:30 Water level @ ground surface
"	11:30 to 12:40	N/A	Max Min N/A Mean		N/A	▲ Lunch break.
Casing 127 Soil 124.6	12:40 to 13:04	Grey brown med. to coarse SAND. some gravels.	Max Min N/A Mean		1.5	▲ 13:04 Water level in the casing @ 1' below ground surface.
Casing 127 Soil 125	13:15 to 13:40	" occasional gravel.	Max Min N/A Mean		1.0	▲ 13:40 Water level in the casing @ 16' below G.S. ▲ 13:45 Water added to 4' above ground surface
Casing 127.2 Soil 124.7	13:45 to 14:18	"	Max 1000 Min 200 Mean 600		-0.5	▲ 14:20 to 14:26 Try to advance the casing. Very difficult. Casing won't rotate freely.

Note:



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 2 of 2  
Date 12/19/78  
Observer SEB

D-35

INSTALLATION LOG, PILE NO. DP-1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 127.2	14:40	Grey brown med. to coarse	Max			▲ 13:15 to 15:00 Estimate cuttings in the bin of 3460 in <sup>3</sup> . It represents 13.6" advance or 12.2" if bulking is 10%. Compare against 8" advance between 13:15 and 15:00.
Soil	to	SAND w/ occasional gravels.	Min	N/A	1.5	
125.2	15:00		Mean			
Casing 127.2	15:17	"	Max			▲ 15:00 Water level in the casing @ 3' above G.S. ▲ 15:50 Water level @ 4' above G.S. Adding water about every 10 minutes. ▲ 15:55 ~ 16:12 Add spot beads to casing to improve grip of clamp. ▲ Measured discharge of 2 consecutive grab contents. Ave. = 135 in <sup>3</sup> or 0.53"
Soil	to		Min	N/A	1.5	
126.1	16:22		Mean			
			Max			
			Min			
			Mean			
Casing 127.6	16:22	"	Max	1000	1250	▲ 17:00 Water level in the casing @ 6' above G.S. ▲ 16:12 to 16:22 Casing advanced about 4". Casing twists elastically and rebounds. No movement at depth.
Soil	to		Min	600	1.6	
127	17:00		Mean			
			Max			▲ At 17:00 Total bin volume 7200 in <sup>3</sup> Less 13:15 to 15:00 Vol. 3470 in <sup>3</sup> Vol excavated 15:00 to 17:00 3730 in <sup>3</sup> Represents 14.7" advance Less 10% bulking = 1.5 13.2" This does not check w/ 21" advance measured in casing.
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note: 1) Excavation tool: Small 2 prong hammer grab.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 12/19 ~ 12/20/78  
Observer D. TSO

D-36

INSTALLATION LOG, PILE NO. DP-1

Batter 4 V. to 1 H.  
G.S. Elevation ±422ft  
Weather Foggy

Operating Crew: 2nd shift  
Supervisors 1 Operators 1  
Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 129 Soil 128	18:30 to 21:00	Grey med. to coarse SAND some fine to med. gravel.	Max Min Mean 1000		0.4	▲ 18:30 Soil @ 127' ▲ 19:30 Soil @ 127'3" ▲ 20:00 Advance casing from 127'5" to 128'4" ▲ 21:00 Soil @ 128' Advance casing to 129'
"	21:00 to 21:30	N/A	Max Min Mean	N/A	N/A	▲ Coffee break.
Casing 130.5 Soil 129.5	21:30 to 24:00	Grey med. to coarse SAND some fine to med. gravel	Max Min Mean 1000		0.6	▲ 22:00 Advance casing to 129'2" ▲ 22:30 Soil @ 128'7" Advance casing to 129'6" ▲ 23:30 Soil @ 129'4" Advance casing to 130'4" ▲ 24:00 Soil @ 129'6" Advance casing to 130'6"
Casing 130.8 Soil 130.	0:00 to 1:30	Grey coarse SAND. some med. to coarse gravel	Max Min Mean 1000		0.3	▲ 0:30 Soil @ 129'9" Advance casing to 130'8" ▲ 1:00 Soil @ 129'7" ▲ 1:30 Soil @ 130' ▲ Many times some coarse gravel lodged between the grab jaws so that finer materials were washed away.
"	1:30 to 2:00	N/A	Max Min Mean	N/A	N/A	▲ Lunch break.
Casing 131.8 Soil 131	2:00 to 3:00	Grey med. to coarse SAND. trace fine gravel	Max Min Mean 1000		1.0	▲ 3:10 Add water to 11 ft above G.S.
			Max Min Mean			
			Max Min Mean			

Note (1) Excavation tool: Small 2 prong hammer grab

(2) 17:30 to 24:00, the excavated material retained in the bin is estimated to be 1.5 times more than those measured thru. tape.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 12/20/78  
Observer RQ/SFG

D-37

INSTALLATION LOG PILE NO. DP-1

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather Foggy - 48°

Operating Crew:

Supervisors G. Tricher Operators 1

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 132.3 Soil 131.6	7:15 to 7:45	Grey, coarse to fine SAND trace silt w/ limestone fragments.	Max 900 Min 200 Mean	N/A	1.6	▲ 7:45 water level in the casing 3' above G.S. ▲ pump in water every 10 min. or so. ▲ Bedrock encountered at 131' 7" (Elev. 293) ▲ Ground water table @ 25' below G.S.
Casing 131.3 Soil 131.8	7:40 to 8:30	Limestone chips up to 4" in length.	Max Min Mean		0.5	▲ Water about 3' above G.S. Adding water. ▲ Attempt to advance casing. No progress.
Casing 132.3 Soil 132.3	8:30 to 9:50	"	Max Min Mean		1.3	▲ Water about 5' above G.S. Adding water. ▲ Attempt to advance casing. No progress.
" " "	9:50 to 10:30	N/A	Max Min Mean	N/A	N/A	▲ Excavation stopped to allow suspended material, if any, to settle to the bottom.
" " "	10:30 to 10:47	Limestone chips to less than 1"	Max Min Mean		0.	▲ 27 min. No excavation progress. Refusal to grab. ▲ 10:47 water level in the casing 6' 7" above ground surface. ▲ Stop adding water so rate of fall of water
" " "	10:48 to 11:14	N/A	Max Min Mean	N/A	N/A	level could be measured. ▲ Discontinued excavation @ 10:47. ▲ water level in the casing. 2' 7" above G.S. @ 11:14. water level dropped 4" in 26 min.
" " "	11:14 to 11:40	N/A	Max Min Mean	N/A	N/A	▲ 11:40 water level in the casing @ 1' 5" below ground surface. It dropped 4" in 26 min.
" " "			Max Min Mean			▲ Move Benoto rig off DP-1 @ 12:30.

Note:

Page D-38 through Page D-70  
INSTALLATION LOG, PILE NO. DP2



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 2 of 2 D-38  
Date 12/20/78  
Observer SFG

INSTALLATION LOG, PILE NO. DP-2

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
N/A	12:30 to 16:00	N/A	Max	N/A	N/A	▲ Moving rig onto DP-2 from DP-1 ▲ Check alignment of rig w/ reference to E DP2 + DP3 and verticality of rig w/ transit. Check lead batter w/ batter board + carpenter level
			Min			
			Mean			
			Max			▲ Rig skids shimmed with timber and boards. Rig anchored to concrete mat with anchor rods. Large hammer grab attached.
			Min			
			Mean			
N/A	16:00 to 16:50	N/A	Max	N/A	N/A	▲ Set first section of the casing in rig, clamped and checked for alignment.
			Min			
			Mean			
N/A	16:50 to 17:10	N/A	Max		N/A	▲ Pushed first section down 14 ft, ready to receive 2nd section.
			Min			
			Mean			
N/A	17:10 to 19:35	N/A	Max	N/A	N/A	▲ Set 2nd section into place and checked for alignment. Delay in aligning due to breakdown of 15T crane. Finally ready for welding @ 19:35.
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note: (1) Excavation tool: Small 2 prong hammer grab  
(2) DP-1 is completed.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 1 of 1 D-39  
Date 12/20-12/21/78  
Observer D. TSO

INSTALLATION LOG, PILE NO. DP-2

Batter 4 V. to 1 H.

Operating Crew: 2<sup>nd</sup> shift.

G.S. Elevation ±422ft

Supervisors 1 Operators 1

Weather chilly, ~25°

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 14 Soil 6	19:00 to 23:27	N/A	Max Min Mean	N/A	N/A	▲ 19:00 ~ 22:50 Welding of the 2 <sup>nd</sup> section on progress. ▲ 22:50 ~ 23:22 Grinding the weld.
Casing 24 Soil 6	23:27 to 0:10	N/A	Max Min Mean	1400 700 0		▲ 23:27 started to push down the casing. No torque was applied to the casing. ▲ Different down pressure on two cylinders caused uneven downward movement of the casing.
Casing 27.5 Soil 24.5	0:10 to 2:20	Dark brown med. silty CLAY.	Max Min Mean	1400 900		▲ 0:10 stopped advancing the casing. Casing tip @ 24'. ▲ 0:15 Excavation started. ▲ 0:30 Soil @ 15'6". ▲ 0:41 Soil @ 17'6".
			Max Min Mean			▲ 0:50 Soil @ 20'. ▲ 0:53 to 1:05 Advance casing from 24' to 26'. ▲ 1:25 Soil @ 24'. ▲ 1:30 to 2:00 Lunch break. ▲ 2:10 Advance casing from 26' to 27.5'.
Casing 30 Soil 26.3	2:20 to 2:50	Brown fine SAND, trace silt.	Max Min Mean	600 500 1400		▲ 2:20 Sand was noted out of cutting. Soil @ 24'6". ▲ 2:25 Hose broke while trying to add water into casing. ▲ 2:30 Stopped excavation. Soil @ 26'2".
			Max Min Mean			▲ 2:35 Advance casing from 27'6" to 30'. ▲ Ground water table @ 25'2" below G.S.
			Max Min Mean			
			Max Min Mean			

Note: 1) Excavation tool: Large 2 prong hammer grab

2) While excavating thru. the clay fill, it was noted that the water in the casing would keep clay from sticking on the inside wall of the hammer grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2 D-40  
Date 12/21/78  
Observer R.G./SEB

INSTALLATION LOG PILE NO. DP-2

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather Sunny + cool. -30°

Operating Crew:

E. Bigaran

Supervisors G. Tricher

Operators 1

Laborers 2

Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 30 Soil 27.7	7:15 to 7:45	Grey to brown fine SAND. trace silt.	Max 500 Min 250 Mean	1300 700	2.6	
Casing 30.9 Soil 27.7	7:45 to 7:55	N/A	Max Min Mean		N/A	▲ Advance casing from 30' to 30.9'. ▲ Loading the 3rd segment of casing into the rig. ▲ Water pump broke down. A new one was coming in.
"	7:55 to 10:15	N/A	Max Min Mean	N/A	N/A	▲ Repairing the broken down 1st crane. ▲ set up the 3rd section and aligned it.
"	10:15 to 12:00	N/A	Max Min Mean	N/A	N/A	▲ Welding of the 3rd section on progress. ▲ Preparing weighing area. Setting scales and racks.
"	12:00 to 12:30	N/A	Max Min Mean	N/A	N/A	▲ Lunch break.
"	12:30 to 15:25	N/A	Max Min Mean	N/A	N/A	▲ Welding completed @ 12:55. ▲ 12:30 WCC started to make ground instruments measurements. Rig stand by ▲ Setting bins + scales continued to 14:30 ▲ weighed Bin A. Tare = 464 lbs (incl. rack) ▲ 15:25 casing @ 30'11". Soil @ 27'8"
Casing 33.6 Soil 29.4	15:25 to 16:10	Brown fine stiff SAND. occasional gravels to 2 1/2" diam.	Max 500 Min 250 Mean	1300 700	3.0	▲ Advancing casing intermittently while excavation ▲ Excavation not continuous due to modifications of operator's cab. ▲ 16:10 water in the casing @ 2'5" above G.S.
Casing 35.9 Soil 32.4	16:18 to 16:55	" Gravelly seam between 25'9" + 30'6"	Max 500 Min 250 Mean	1300 700	4.9	▲ Grab excavating full buckets. ▲ 16:45 water was added into casing ▲ 16:55 water in the casing @ 1'7" above G.S.

Note

WOODWARD-GLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 2 of 2  
Date 12/21/78  
Observer SFG

D-41

INSTALLATION LOG PILE NO. DD-2

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 35.9 Soil 32.9	17:02 to 17:07	Brown silty fine SAND w/ occasional gravel to 1 1/2"	Max Min Mean	N/A	6.0	▲ No water added since 16:45. ▲ 17:12 Water in the casing @ 3'1" below G.S.
Casing 37.7 Soil 34.1	17:45 to 18:00	Brown grey fine to med. SAND	Max Min Mean		4.7	▲ Water in the casing @ 3' above G.S.
Casing 38.7 Soil 36.4	18:00 to 19:00	Grey fine to med. SAND fairly clean	Max Min Mean		2.4	▲ Excavation more difficult Hammer grab about 1/3 full (18:49). when pullout rate reduced more material picked up.
Casing 38.7 Soil 37.5	19:07 to 19:25	Grey fine to med. silty SAND	Max Min Mean		3.6	▲ Added water into casing. ▲ Bin weighing. Total excavation = 9'10"
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 12/21-12/22/78  
Observer D. TSO

D-42

INSTALLATION LOG, PILE NO. DP-2

Batter 4 V. to 1 H.

G.S. Elevation ±422.1

Weather ~30°

Operating Crew: 2nd shift

Supervisors 1 Operators 1

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 42.2 Soil 40.2	19:25 to 21:00	Grey fine SAND trace silt.	Max Min Mean 700		2.0	▲ 19:25 Casing @ 38.7' Soil @ 37.5'
"	21:00 to 21:30	N/A	Max Min Mean	N/A	N/A	▲ Coffee break.
Casing 42.2 Soil 41.7	21:30 to 22:03	Grey fine to med. SAND trace coarse sand, fine gravel.	Max Min Mean		3.9	▲ 21:30 Soil @ 39.7' (creep in during break?)
Casing 44 Soil 41.7	22:03 to 22:30	N/A	Max Min Mean 700		N/A	▲ 22:07 Advance casing from 42.2' to 44'
Casing 45 Soil 43	22:30 to 23:12	Grey fine to med. SAND trace coarse sand.	Max Min Mean 700		1400	▲ 22:30 Advance casing from 44' to 45' ▲ 22:50 Soil @ 43' ▲ 22:55 Advance casing from 45' to 46'
"	23:12 to 23:25	N/A	Max Min Mean	N/A	N/A	▲ Moving the bin away from below the spout so that it won't hinder further advancement of the casing. ▲ A small iron barrel is used to retain excavated soil and then dumped into the bin.
Casing 46.5 Soil 45.2	23:25 to 0:00	Grey fine to coarse SAND	Max Min Mean		4.4	▲ 23:25 Soil @ 43.4' ▲ 23:25 - 23:35 Advance casing from 46' to 46'6" ▲ 0:00 Soil @ 45.2'
Casing 48.2 Soil 46.7	0:00 to 0:55	Grey fine SAND, trace silt.	Max Min Mean		2.4	▲ 0:05 Advance casing from 46.5' to 47' ▲ 0:30 Soil @ 46.2' ▲ 0:40 Advance casing from 47' to 48.2' ▲ 0:40 to 0:43 Add water into casing.

Note:

WOODWARD-CLYDE CONSULTANTS  
 LOCKS AND DAM NO. 28  
 DRILLED-IN PILE TEST

P. 2 of 2  
 Date 12/21-12/22/78  
 Observer D. TSO

D-43

INSTALLATION LOG, PILE NO. DP-2

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 49.7 Soil 46.7	1:15 to 2:00	N/A	Max Min Mean 700	1400	N/A	▲ 0:55 Soil @ 46'9". Stopped excavation. ▲ 1:15 Advance casing from 46'3" to 49'9" ▲ 1:30 to 2:00 set the 4 <sup>th</sup> section on the side of the rig. ▲ Crew skipped their lunch break and worked through. Knocked off at 2:00
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 12/22/78  
Observer RQ/SPG

D-44

INSTALLATION LOG FILE NO. 00-2

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather clear, 32° - 48°

Operating Crew: 1st shift

Supervisors E. Bigaran

G. Tricher

Operators 2

Laborers 3

Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
<u>Casing</u> <u>49.7</u> <u>50.1</u> <u>46.7</u>	<u>7:30</u> <u>to</u> <u>14:30</u>	<u>N/A</u>	<u>Max</u> <u>Min</u> <u>Mean</u>	<u>N/A</u>	<u>N/A</u>	<u>▲ Welding of 4th section in progress</u> <u>▲ Water in the casing @ G.S.</u> <u>▲ Ground water table @ 25 ft below G.S.</u> <u>▲ 14:30 welding and grinding completed.</u>
<u>"</u>	<u>14:30</u> <u>to</u> <u>19:00</u>	<u>N/A</u>	<u>Max</u> <u>Min</u> <u>Mean</u>	<u>N/A</u>	<u>N/A</u>	<u>▲ Get ready for Christmas vacation.</u> <u>No excavation was done</u>
			<u>Max</u> <u>Min</u> <u>Mean</u>			
			<u>Max</u> <u>Min</u> <u>Mean</u>			
			<u>Max</u> <u>Min</u> <u>Mean</u>			
			<u>Max</u> <u>Min</u> <u>Mean</u>			
			<u>Max</u> <u>Min</u> <u>Mean</u>			
			<u>Max</u> <u>Min</u> <u>Mean</u>			

Notes

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1 D-46  
Date 12/22-12/23/78  
Observer                     

INSTALLATION LOG, PILE NO. DD-2

Batter 4 V. to 1 H.  
G.S. Elevation ±422ft  
Weather                     

Operating Crew: 2<sup>nd</sup> shift  
Supervisors 1 Operators 1  
Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 49.7 Soil 46.7	19:00 to 3:30	N/A	Max Min Mean	N/A	N/A	▲ Get ready for Christmas vacation. No excavation was done.
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 12/27/78  
Observer D.T.S.

D-46

INSTALLATION LOG FILE NO. DP-2

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather chilly

Operating Crew: 1<sup>st</sup> shift

Supervisors 1 Operators 1

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 49.7 Soil 46.7	7:15 to 10:30	N/A	Max Min Mean	N/A	N/A	▲ To clean the ice from water hose & valve of water tank. ▲ Replace the broken coupling of the hose connection. ▲ Water in the casing @ 25'3" below G.S.
"	10:30 to 10:55	N/A	Max Min Mean	N/A	N/A	▲ Add water into the casing to G.S.
Casing 51.3 Soil 48.6	10:55 to 11:45	Grey fine SAND, trace silt.	Max Min Mean 700	1400	1.9	▲ 10:55 start excavation. Some clayey silt chunks for about 1/2" thick noted in the cuttings in the beginning. ▲ 11:45 Soil @ 48'7". Casing @ 51'4".
"	11:45 to 12:35	N/A	Max Min Mean	N/A	N/A	▲ Lunch break.
"	12:35 to 14:00	N/A	Max Min Mean	N/A	N/A	▲ Replace the generator belt of the rig.
Casing Soil	14:00 to 14:55	Grey fine to med. SAND, trace coarse sand.	Max Min Mean 700	1400		▲ Slipping between clamp and casing while advancing.
Casing 54 Soil 50.5	14:55 to 15:20	Grey fine to med. SAND, trace fine to med. gravel.	Max Min Mean 700	1400	2.0	▲ 15:00 Casing @ 54' Soil @ 50'6".
Casing 55.8 Soil 52.8	15:20 to 16:20	Grey med. to coarse SAND, trace fine to med. gravel.	Max Min Mean 700	1400	2.4	▲ 16:00 Casing @ 55'10" Soil @ 52'10"

Notes

WOODWARD-CLYDE CONSULTANTS  
 LOCKS AND DAM NO. 26  
 DRILLED-IN PILE TEST

P. 2 of 2  
 Date 12/27/77  
 Observer D. TSO

D-47

INSTALLATION LOG, PILE NO. DP-2

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing N/A	16:20	Grey coarse	Max			▲ Cutting material becomes coarser. No measurements of casing + soil depth were made.
Soil	to	SAND, some fine to coarse	Min			
N/A	16:35	gravel.	Mean 700	1400		
Casing 58	16:35	Grey med.	Max		4.0	▲ Excavation stopped @ 17:10.
Soil	to	to coarse	Min			
56.8	17:10	SAND, trace fine gravel.	Mean 700	1400		
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 1 of 1 D-48  
Date 12/27-12/28/78  
Observer R. Fasano

INSTALLATION LOG, PILE NO. DP-2

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather clear, cold

Operating Crew: 2<sup>nd</sup> shift

Supervisors 1 Operators 1

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 61 Soil 60	17:40 to 18:35	Grey med. to coarse SAND trace fine gravel	Max Min Mean			▲ In reciprocating movement, the casing rotates for about 1.5" ▲ 18:07 to 18:35 shifting the bin and weighing the cutting
Casing 64 Soil 62	18:35 to 20:00	Grey coarse to med. SAND	Max Min Mean		1.4	
"	20:00 to 20:30	N/A	Max Min Mean	N/A	N/A	▲ Waiting for cherry picker. Move bin away from chute for further down travel of chute. Short barrel catches cuttings.
"	20:30 to 21:30	N/A	Max Min Mean	N/A	N/A	▲ Coffee break.
Casing 67.5 Soil 66.2	21:30 to 22:00	Grey coarse to fine SAND	Max Min Mean		3.6	
Casing 68 Soil 66.2	22:40 to 23:30	N/A	Max Min Mean	N/A	N/A	▲ Advance casing from 67.5' to 68'
"	23:30 to 0:30	N/A	Max Min Mean	N/A	N/A	▲ Lunch break.
"	0:30 to 3:00	N/A	Max Min Mean	N/A	N/A	▲ 0:30 to 1:30 wait for cherry picker to lift the 5 <sup>th</sup> section of casing into place. ▲ Welder grinds + cleans ends of casing in preparation of welding

Note: 1) Excavation tool: Large 2 prong hammer grab.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 12/28/78  
Observer D. TSO

D-44

INSTALLATION LOG, PILE NO. OP-2

Batter 4 V. to 1 H.  
G.S. Elevation ±422ft  
Weather \_\_\_\_\_

Operating Crew: 1st shift  
Supervisors 1 Operators 1  
Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 68 Soil 66.2	7:00 to 11:30	N/A	Max Min Mean	N/A	N/A	▲ Welding of the 5th section of casing in progress.
"	11:30 to 17:00	N/A	Max Min Mean	N/A	N/A	▲ WCC crew make ground instrument measurements. (same crew make G.I. measurements for Rock Anchor test in the morning)
"	17:00 to 17:30	N/A	Max Min Mean	N/A	N/A	▲ shift change of the operating crew.
Casing 71.2 Soil 67.7	17:30 to 19:00	Grey fine to coarse SAND trace fine gravel	Max Min Mean 700	1400	1.0	
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1 D-50  
Date 12/28-12/29/78  
Observer R.Q.

INSTALLATION LOG PILE NO. DP-2

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather ~32°

Operating Crew: 2<sup>nd</sup> shift

Supervisors 1 Operators 1

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 71.2 Soil 67.7	19:00 to 19:30	N/A	Max Min Mean	N/A	N/A	▲ Adding water into casing.
Casing 75 Soil 73	19:30 to 20:00	Grey fine to med. SAND trace silt.	Max 500 Min 250 Mean	1300 1100	3.5	▲ Water in the casing @ 3 ft above G.S.
Casing 76 Soil 74.5	20:00 to 21:00	"	Max 500 Min 250 Mean	1300 1100	1.8	
"	21:00 to 21:30	N/A	Max Min Mean	N/A	N/A	▲ Coffee break.
Casing 76.5 Soil 76.2	21:30 to 22:30	Grey fine to med. SAND. trace silt	Max 500 Min 250 Mean	1300 1100	2.0	▲ Water in the casing @ 3 ft above G.S. ▲ Shift bins and weigh the cuttings
Casing 80 Soil 79	22:30 to 0:00	Grey fine SAND trace silt.	Max 900 Min 250 Mean	1300	1.9	▲ Water in the casing @ 3 ft above G.S. ▲ Ground water table @ 25.3 ft below G.S.
"	0:00 to 0:50	N/A	Max Min Mean	N/A	N/A	▲ Lunch break.
Casing 82 Soil 80	0:50 to 3:00	Grey fine SAND. trace silt.	Max 900 Min 250 Mean	1300	0.8	▲ 0:50 to 1:30 Repair work on the clamp. ▲ 3:00 Water in the casing @ 4 ft above G.S.

Note (1) Excavation tool: Large 2 prong hammer grab.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 12/29/78  
Observer D ISO

D-51

INSTALLATION LOG, PILE NO. DP-2

Batter 4 V. to 1 H.  
G.S. Elevation ±422ft  
Weather raining

Operating Crew: 1st shift  
Supervisors 1 Operators 1  
Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 82 Soil 80	7:00 to 7:30	N/A	Max Min Mean	N/A	N/A	▲ Fill the fuel tank and warming up the rig.
Casing 85 Soil 82.4	7:30 to 9:20	Grey fine SAND. trace silt.	Max Min Mean 700	1400	1.3	▲ 8:30 Casing @ 84' Soil @ 82' ▲ 9:30 Casing @ 85' Soil @ 82.5"
Casing 86 Soil 82.4	9:30 to 10:10	N/A	Max Min Mean	N/A	N/A	▲ Advance casing from 85' to 86' ▲ Ready to receive the next section
Casing 86 Soil 82.4	10:10 to 11:15	N/A	Max Min Mean	N/A	N/A	▲ 10:10 to 10:35 Fix the rail of the platform which was broken when the cherry picker tries to lift open the platform. ▲ 10:35 to 11:15 set the 6 <sup>th</sup> section on position and aligned it.
" to 16:15	11:15 to 16:15	N/A	Max Min Mean	N/A	N/A	▲ Welding the 6 <sup>th</sup> section in progress.
Casing 86.4 Soil 84.7	16:15 to 19:00	Grey fine SAND. trace silt.	Max Min Mean 700	1400	2.5	▲ 16:15 Excavation resumed. ▲ 16:40 Casing @ 86'. Soil @ 83'8" ▲ 17:10 Casing @ 86.5". Soil @ 84'8" ▲ 17:10 to 17:40 shift change of operating crew.
			Max Min Mean			▲ 17:40 to 19:00 Jaws of the hammer grab won't open. Repairing in progress.
			Max Min Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 12/29-12/30/78  
Observer R.Q.

D-52

INSTALLATION LOG, PILE NO. DP-2

Batter 4 V. to 1 H.

Operating Crew:

G.S. Elevation ±422ft

Supervisors Armando Operators 2

Weather Rainning, 32°

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 86.4 Soil 84.7	19:00 to 20:00	N/A	Max Min Mean	N/A	N/A	<p>▲ Repairing the hammer grab</p> <p>▲ Replace the large hammer grab w/ the small one.</p>
Casing 88 Soil 85.6	20:00 to 21:00	Grey fine to coarse SAND trace Silt, some fine gravel	Max 500 Min 200 Mean	1300 700	0.9	<p>▲ Water in the casing @ 4ft above G.S.</p>
"	21:00 to 21:30	N/A	Max Min Mean	N/A	N/A	<p>▲ Coffee break</p>
"	21:30 to 22:00	N/A	Max Min Mean	N/A	N/A	<p>▲ Return to large hammer grab due to the relatively low recovery of the small one.</p>
Casing 89 Soil 88	22:00 to 23:30	Grey fine to coarse SAND trace Silt some fine gravel	Max Min Mean		1.6	<p>▲ Recovery improved</p>
Casing 91 Soil 89.5	23:30 to 0:30	"	Max 900 Min 300 Mean	1400 800	1.5	<p>▲ Water in the casing @ 5ft above G.S.</p> <p>▲ Add Water occasionally</p>
Casing 93 Soil 91.7	0:30 to 1:50	"	Max 900 Min 300 Mean	1400 800	1.9	<p>▲ Water in the casing @ 4ft above G.S.</p> <p>▲ Shift bins and weigh the contents</p>
Casing 96 Soil 94	1:50 to 3:05	"	Max 900 Min 300 Mean	1400 800	2.3	<p>▲ Water in the casing @ 4ft above G.S.</p> <p>▲ Ground water table @ 25" below G.S.</p>

Note: (1) Excavation tool: Small 2 prong hammer grab. It was replaced by large hammer grab at 21:30

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 12/30/78  
Observer D.TSO

D-53

INSTALLATION LOG, PILE NO. DP-2

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather \_\_\_\_\_

Operating Crew: 1st shift

Supervisors 1 Operators 1

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 99.7 Soil 96.1	7:00 to 9:00	Grey med. to coarse sand, some fine to med. gravel	Max Min Mean 700		1.5	▲ 7:15 Soil @ 93'11" Casing @ 96' Water @ 13' below G.S. ▲ 7:30 Excavation started. ▲ 8:00 Soil @ 94'9" Casing @ 98'5"
Casing 104.2 Soil 99.2	9:00 to 10:40	Grey med. to coarse sand trace fine to med. gravel.	Max Min Mean 700		1.9	▲ 8:50 some lignite noted in the cutting. ▲ 8:55 Reciprocating movement of the casing about 1" ▲ 9:35 Soil @ 99' Casing @ 102'5"
Casing 104.2 Soil 99.2	10:40 to 16:20	N/A	Max Min Mean	N/A	N/A	▲ 10:40 Soil @ 99'5" Casing @ 104'2" ▲ 11:00~12:00 Set the 7 <sup>th</sup> section of casing on position. ▲ 11:00 NCC crew make ground instrument measurements.
			Max Min Mean			▲ 16:20 Complete welding. ▲ 16:20 to 19:00 Operation shut down due to the freezing rain which started at 4:30
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note (1) Excavation tool: Large ± prong hammer grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 12/30-12/31/78  
Observer R.Q.

D-54

INSTALLATION LOG, PILE NO. DP-2

Batter 4 V. to 1 H.

Operating Crew: 2<sup>nd</sup> shift

G.S. Elevation ±422ft

Supervisors 1 Operators 1

Weather \_\_\_\_\_

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 104.2	19:00	N/A	Max		N/A	▲ 19:00 to 19:30 Pump water into casing ▲ 19:45 Field supervisor of the contractor decided to shut down the work due to hazardous working condition from the freezing rain.
to			Min	N/A		
Soil 99.2	19:45		Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note:

WOODWARD-CLYDE CONSULTANTS  
 LOCKS AND DAM NO. 28  
 DRILLED-IN PILE TEST

P. 1 of 1  
 Date 1/2/79  
 Observer D. TSO

D-55

INSTALLATION LOG, PILE NO. DP-2

Batter 4 V. to 1 H.

Operating Crew: 1st shift

G.S. Elevation ±422ft

Supervisors 1 Operators 1

Weather \_\_\_\_\_

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 104.2	7:00	N/A	Max		N/A	No excavation was done for this shift. The rail of the platform was broken on 12/31 night. All the time of this shift was spent in fixing it.
to			Min	N/A		
Soil 99.2	18:00		Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note:



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/2 - 1/31/79  
Observer R.Q.

D-56

INSTALLATION LOG, PILE NO. 00-2

Batter 4 V. to 1 H.

G.S. Elevation ± 422ft

Weather Very chilly, -12°

Operating Crew: 2nd shift

Supervisors Armando Operators 2

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 104.2 Soil 100.	19:00 to 22:30	Grey fine to coarse SAND. trace silt. some fine gravel	Max		3.3 (10" in 15 min.)	▲ 22:30 water in the casing @ 5 ft above ground surface. ▲ Most of the time is spent in thawing the water hose, hydraulic hose of the rig and the ice formed on the inside wall of the casing which prevents the free fall of the hammer grab. ▲ Ground water table @ 25' 6" below G.S.
			Min	N/A		
			Mean			
			Max			
			Min			
			Mean			
Casing 104.2 Soil 101.1	22:30 to 2:30	Grey fine to coarse SAND trace silt. trace fine gravel.	Max		6.5 (1' in 10 min.)	▲ Spent most of the time in thawing ice.
			Min	N/A		
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/31/79  
Observer D. ISO

D-57

INSTALLATION LOG, PILE NO. DP-2

Batter 4 V. to 1 H.

Operating Crew: 1st shift

G.S. Elevation ±422ft

Supervisors 1 Operators 1

Weather Sunny, cold

Laborers 5 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 104.2	7:00	N/A	Max		N/A	▲ 7:00 Casing @ 104'2" Soil @ 101'1"
Soil	to		Min	N/A		▲ Thawing ice of about 1/2" thick on the inside face of the casing
101.1	12:00		Mean			▲ Thawing ice of about 2" thick in the water tank which make infilling impossible
"	12:00	N/A	Max		N/A	▲ Lunch break.
to			Min	N/A		
12:40			Mean			
Casing 107.8	12:40	Grey med. to coarse sand trace fine to coarse gravel	Max		1.2	▲ 13:45 Casing @ 104'2" Soil @ 103'6"
Soil	to		Min			▲ 14:45 Casing @ 105'3" Soil @ 103'7"
106.1	17:00		Mean 700	1400		▲ Slipping between the clamp & the casing while rotating the casing. ▲ 16:15 Casing @ 106'5" Soil @ 105'5"
"	17:00	N/A	Max		N/A	▲ 17:15 Casing @ 107'10" Soil @ 106'1"
to			Min	N/A		
18:00			Mean			
"	18:00	N/A	Max		N/A	▲ Jaw of the hammer grab won't open. Repairing in progress.
to			Min	N/A		
18:35			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.

(2) Bit A was partly damaged during transporting to the scales last night. Before it is fixed only Bit B is available.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/3-1/4/79  
Observer R.Q.

D-58

INSTALLATION LOG PILE NO. DP-2

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather Cold. ~20°

Operating Crew:

Supervisors Armando Operators 2

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 108 Soil 107.1	18:00 to 19:00	Grey fine to med. SAND trace silt.	Max Min Mean 900	1500 1400 1450	1.0	▲ Water in the casing is at ground surface
Casing 111 Soil 108.5	19:00 to 20:20	"	Max Min Mean 900	1500 1400 1450	1.4	▲ Water in the casing is at ground surface
Casing 111 Soil 109.5	20:20 to 22:30	"	Max Min Mean	N/A	1.0	▲ 21:00 ~ 21:40 Coffee break. ▲ Water in the casing is at ground surface
" to 23:00	22:30 to 23:00	N/A	Max Min Mean	N/A	N/A	▲ Jaw of the hammer grab won't open. Repairing in progress
Casing 113 Soil 111.1	23:00 to 0:10	Grey fine to med. SAND trace silt.	Max Min Mean 900	1400	1.6	▲ Add water into casing. Water level in the casing is at ground surface.
Casing 113 Soil 111.1	0:10 to 1:30	"	Max Min Mean 900	1400	0.0	▲ No excavation progress.
Casing 115 Soil 112	1:30 to 3:00	"	Max Min Mean 900	1400	1.0	▲ Add water into casing to ground surface level.
			Max Min Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/4/79  
Observer D. TSO

D-59

INSTALLATION LOG PILE NO. DP-2

Batter 4 V. to 1 H.  
G.S. Elevation ±422ft  
Weather \_\_\_\_\_

Operating Crew: 1st shift  
Supervisors 1 Operators 1  
Laborers 6 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 114 Soil 112	7:00 to 8:25	N/A	Max Min Mean	N/A	N/A	▲ Connect all the hoses which run between the river and the water tank
Casing 115.7 Soil 113.7	8:25 to 10:00	Grey fine to coarse SAND trace fine to med. gravel	Max Min Mean 700	1400	1.1	▲ 9:30 Casing @ 115'8". Soil @ 113'8"
"	10:00 to 11:25	N/A	Max Min Mean	N/A	N/A	▲ Deice the frozen water hoses.
Casing 116.2 Soil 114.7	11:25 to 12:00	Grey fine to coarse SAND trace fine to med. gravel.	Max Min Mean 700	1400	1.7	▲ Some clayey silt chunks noted in the cutting from the first 2 grabs. ▲ To run a complete excavation cycle takes 2 min. 10 sec. ▲ 11:45 Casing @ 116'3". Soil @ 114'8"
"	12:00 to 12:30	N/A	Max Min Mean	N/A	N/A	▲ Lunch break.
Casing 117.8 Soil 116.2	12:30 to 15:00	Grey fine to coarse SAND trace fine to med. gravel.	Max Min Mean 700	1400	0.6	▲ 13:20 to 14:05 Very low percentage recovery due to ice in the mechanism of the hammer grab.
Casing 121.4 Soil 119.8	15:00 to 17:30	Grey med. to coarse SAND with fine to coarse gravel.	Max Min Mean 700	1400	1.8	▲ 16:40 Casing @ 120'8". Soil @ 119'10". ▲ 16:40 to 17:10 Advance casing from 120'8" to 121'5" ▲ 17:10 Casing @ 121'5". Soil @ 119'10".
			Max Min Mean			▲ 16:30 WCC crew started to made ground instrument measurements while excavation was carried on.

Note (1) Excavation tool: Large 2 prong hammer grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1 D-60  
Date 1/4 ~ 1/5/79  
Observer RQ

INSTALLATION LOG, FILE NO. DP-2

Batter 4 V. to 1 H.

Operating Crew: 2nd shift

G.S. Elevation ±422ft

Supervisors Armando Operators 2

Weather SNOW, -12°

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 122	18:30	N/A	Max		N/A	▲ 18:30 Advance the casing for 7" it is ready to receive the 8th section.
Soil	to		Min			▲ 19:00 ~ 1:00 Welding the 8th section.
119.8	1:00		Mean			It is completed @ 1:00.
"	1:00	N/A	Max		N/A	▲ Lunch break.
	to		Min	N/A		
	1:30		Mean			
"	1:30	N/A	Max		N/A	▲ Weather is getting very cold. Heavy snow causes hazardous working condition. The contractor decided to shut down the operation @ 2:00.
	to		Min	N/A		
	2:00		Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/5/79  
Observer D. TSO

D-61

INSTALLATION LOG, PILE NO. DD-2

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather \_\_\_\_\_

Operating Crew: 1st shift

Supervisors 1 Operators 1

Laborers 6 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 122 Soil 119.8	7:00 to 10:00	N/A	Max Min Mean	N/A	N/A	▲ 7:00 Casing @ 122' Soil @ 119'10" ▲ 10:00 start operation
Casing 123.7 Soil 121.2	10:00 to 12:00	Grey med. to coarse SAND some fine to med. gravel trace coarse gravel	Max Min Mean 700	1400		▲ 10:55 Casing @ 123'9" Soil @ 120'5" Add water into casing to 10' above G.S. ▲ 11:15 Casing @ 124'3" Soil @ 121'3"
"	12:00 to 12:30	N/A	Max Min Mean	N/A	N/A	▲ Lunch break.
Casing 127.2 Soil 126.2	12:30 to 17:30	Grey med. to coarse SAND trace fine to med. gravel	Max Min Mean 700	1400	1.0	▲ 13:05 Casing @ 124'8" Soil @ 123'8" ▲ Casing rotates about 1/2" during rotation ▲ 15:05 Casing @ 126' Soil @ 125' ▲ 16:20 Casing @ 127'3" Soil @ 126'3" ▲ 16:30 to 17:30 shifting + weighing the bin. Because no spare bin is available operation is stopped during weighing + sampling.
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/5-1/6/79  
Observer R.Q.

D-62

INSTALLATION LOG, PILE NO. DP-2

Batter 4 V. to 1 H.

Operating Crew: 2nd shift

G.S. Elevation ±422ft

Supervisors Armando Operators 1

Weather Cold, light snow, -20°

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 129.2 Soil 127.6	19:00 to 21:00	Grey fine to med sand trace silt.	Max Min Mean 900	  1300	1.3	▲ Having troubles w/ frozen hoses & ice on the inside face of the casing. More than half of the time is spent in deicing.
"	21:00 to 21:30	N/A	Max Min Mean	 N/A  	N/A	▲ Coffee break
Casing 130.5 Soil 129.	21:30 to 23:45	Grey fine to coarse sand trace silt. Some fine to coarse gravel (cobble)	Max Min Mean 900	  1300	1.4	▲ Most of the time spent in deicing. ▲ Water in the casing 3 ft above ground surface.
Casing 131.2 Soil 130.2	23:45 to 1:30	"	Max Min Mean 900	  1300	1.3	▲ About 45 min. are spent in deicing.
"	1:30 to 2:00	N/A	Max Min Mean	 N/A  	N/A	▲ Lunch break.
"	2:00 to 3:15	N/A	Max Min Mean	 N/A  	N/A	▲ Clean up.
			Max Min Mean	  		
			Max Min Mean	  		

Note: 1) Excavation tool: Large 2 prong hammer grab.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/6/79  
Observer D. Tso

D-63

INSTALLATION LOG PILE NO. DP-2

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather \_\_\_\_\_

Operating Crew: 1<sup>st</sup> shift

Supervisors 1 Operators 1

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 131.2	7:00	N/A	Max			▲ Operator & oiler didn't show up this morning until 10:00. ▲ The contractor decided to install new cylinders w/ larger capacity to rotate the casing. Rig was moved off DP-2 and had mechanics worked on it.
Soil	to		Min	N/A	N/A	
130.3	17:30		Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/6/79  
Observer D. TSO

D-64

INSTALLATION LOG, PILE NO. DP-2, DP-1

Batter 4 V. to 1 H.  
G.S. Elevation ±422ft  
Weather \_\_\_\_\_

Operating Crew: 1st shift  
Supervisors 1 Operators 1  
Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
	7:00 to 11:20	N/A	Max Min Mean	N/A	N/A	▲ Replacing cylinders in progress. ▲ Preparing for the drilling of rock socket of DP-1.
	11:20 to 11:45	N/A	Max Min Mean	N/A	N/A	▲ Lowering the rods + bit into DP-1.
	11:45 to 12:30	N/A	Max Min Mean	N/A	N/A	▲ Lunch break.
	12:30 to 14:28	N/A	Max Min Mean	N/A	N/A	▲ Filling a temporary reservoir w/ water for circulating fluid. ▲ Drill thru. grout in the bottom of the casing @ elev. 124'5".
	14:28 to 17:30	N/A	Max Min Mean	N/A	N/A	▲ 14:28 the bit hit bedrock @ 131'1" ▲ 14:28 to 14:31 Foot mark drilling rod. ▲ 14:31 to 14:39 Drill from 131'1" to 132'3" (down press.: 0)
			Max Min Mean			14:39 to 14:47 Drill from 132'3" to 134'3" (down press.: 400 psi) 14:47 to 14:55 Drill from 134'3" to 135'3" (down press.: 400 psi)
			Max Min Mean			14:55 to 15:04 Drill from 135'3" to 136'3" (down press.: 400 psi) ▲ 15:04 to 17:30 Retract rods + bit.
			Max Min Mean			

Note: (1) Excavation tool: Tricone rotary bit.

WOODWARD-CLYDE CONSULTANTS  
 LOCKS AND DAM NO. 28  
 DRILLED-IN PILE TEST

P. 1 of 1 D-65  
 Date 1/7 to 1/10/79  
 Observer \_\_\_\_\_

INSTALLATION LOG PILE NO. DP-2

Batter 4 V. to 1 H.

Operating Crew:

G.S. Elevation ±422ft

Supervisors \_\_\_\_\_ Operators \_\_\_\_\_

Weather \_\_\_\_\_

Laborers \_\_\_\_\_ Others \_\_\_\_\_

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
N/A	Jan. 7 to Jan. 10	N/A	Max	N/A	N/A	▲ Installation of new cylinders in progress.
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note:



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/11/79  
Observer D.T.S.O.

D-66

INSTALLATION LOG, PILE NO. DP-2

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather SNOWING

Operating Crew: 1st shift

Supervisors 1 Operators 1

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 131.2 Soil 129.5	7:00 to 16:30	N/A	Max Min Mean	N/A	N/A	▲ Replace the wire rope of the rig. ▲ Pull the rig back to DP-2 and anchor it to the concrete mat. ▲ Add water into casing.
Casing 131.2 Soil 129.5	16:30 to 17:00	Grey fine to med. sand some coarse gravel.	Max Min Mean	N/A	0.	▲ 12:00 - 12:30 Lunch break. ▲ Some clayey silt chunks were noted in the cutting. ▲ Zero recovery from the hammer grab.
			Max Min Mean			▲ 17:00 No pressure was transmitted to the arm which rotate the casing while trying to advance the casing. Mechanics were called in to check out and make necessary repair work on the hydraulic system.
			Max Min Mean			▲ 17:30 shift change of operating crew.
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/11 ~ 1/12/79  
Observer R.A.

D-67

INSTALLATION LOG, PILE NO. DD-2

Batter 4 V. to 1 H.

G.S. Elevation ±422ft.

Weather chilly, snowing. -5°

Operating Crew: 2<sup>nd</sup> shift

Supervisors E. Bigman Operators 2

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 131.2 Soil 129.5	19:20 to 21:50		Max Min Mean			<ul style="list-style-type: none"> <li>▲ Repairing the hydraulic system of the rig.</li> <li>▲ Put plastic cover around the rig so that heater can keep its hydraulic system from frozen.</li> </ul>
			Max Min Mean			<ul style="list-style-type: none"> <li>▲ Add water into casing to 3 ft above G.S.</li> <li>▲ 21:00 ~ 21:30 Coffee break.</li> </ul>
Casing 131.7 Soil 131.1	20:50 to 22:55	Grey fine to coarse sand trace silt. some coarse gravel w/ limestone fragments.	Max Min Mean 800		1.3	
Casing 131.7 Soil 131.7	22:55 to 1:30	"some fine gravel w/ limestone fragments.	Max Min Mean 900		0.6	<ul style="list-style-type: none"> <li>▲ Add water into casing to 4 ft above ground surface.</li> </ul>
" to 3:00	1:30 to 3:00	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>▲ Casing sit on the bedrock. No further advancement could be made.</li> <li>▲ The chute won't open Repair work is required.</li> </ul>
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note (1) Excavation tool: Large 2 prong hammer grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/12/79  
Observer D.TSO

D-68

INSTALLATION LOG, PILE NO. DP-2

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather \_\_\_\_\_

Operating Crew: 1st shift

Supervisors 1 Operators 1

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 131.7 Soil 130.7	7:00 to 11:00	N/A	Max Min Mean	N/A	N/A	▲ 7:20 Casing @ 131'8" Soil @ 130'8" ▲ Repair the chute.
Casing 132.2 Soil 131.2	11:00 to 12:00	Grey fine to med. sand	Max Min Mean 900	1400	0.6	▲ Excavation resumed @ 11:00 ▲ WCC crew make 30 gage measurements while operation still in progress. ▲ Casing rotates about 1/2" and rebound 1/4" in rotation.
" to 12:30	12:00 to 12:30	N/A	Max Min Mean	N/A	N/A	▲ Lunch break.
" to 13:50	12:30 to 13:50	N/A	Max Min Mean	N/A	0.0	▲ A complete excavation cycle takes 2 min. ▲ Zero recovery from the hammer grab. No limestone rock is recovered either.
" to 17:30	13:50 to 17:30	N/A	Max Min Mean	N/A	N/A	▲ Hammer grab is decided not suitable for further excavation. ▲ To replace w/ rock chisel. cherry picker is required and it is not available until 14:40.
			Max Min Mean			▲ After chisel is in position, it is found that its upper diameter is larger than the casing and need to be trimmed. ▲ cherry picker broke down and left the chisel on the rig till 17:30.
			Max Min Mean			
			Max Min Mean			

Note (1) Excavation tool: Large 2 prong hammer grab was replaced by rock chisel @ 15:00.

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/12-1/13/79  
Observer R.G.

D-69

INSTALLATION LOG, PILE NO. DP-2

Batter 4 V. to 1 H.

Operating Crew: 2<sup>nd</sup> shift

G.S. Elevation ±422ft

Supervisors E. Bigaman Operators 1

Weather Partly cloudy, snow & sleet at 1:00 1/13/79.

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 132.2 Soil 131.3	18:55 to 19:15	Grey fine to coarse sand, trace silt, cobbles & coarse gravel.	Max Min Mean	N/A	D.3	<ul style="list-style-type: none"> <li>▲ the 3 prong hammer grab was used for excavation.</li> <li>▲ Brown to black silty clay or clayey silt was noted in the cuttings.</li> <li>▲ Limestone bedrock confirmed at depth of 131'4".</li> </ul>
"	19:15 to 22:15	N/A	Max Min Mean	800 1500	N/A	<ul style="list-style-type: none"> <li>▲ 21:00 to 21:30 coffee break.</li> <li>▲ Occasional rotating &amp; thrusting.</li> </ul>
Casing 132.5 Soil 131.3	22:15 to 22:45	Limestone rock fragments.	Max Min Mean		0.0	<ul style="list-style-type: none"> <li>▲ Hard rock surface, no excavation progress.</li> <li>▲ 22:15 to 22:45 Repair &amp; thawing work on chute. (It does not open).</li> <li>▲ Rig is ready to move off from DP-2</li> </ul>
"	22:45 to 1:00	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>▲ Move rig off from DP-2.</li> </ul>
"	1:00 to 1:30	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>▲ Lunch break.</li> </ul>
"	1:30 to 3:00	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>▲ clean up and cut the stick-up part of DP-2 to 1.5 ft above ground surface</li> </ul>
			Max Min Mean			
			Max Min Mean			

Note: (1) Excavation tool: 3 prong hammer grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/13/79  
Observer D. T. SO

D-70

INSTALLATION LOG, PILE NO. DP-2

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather SNOWING

Operating Crew: 1st shift

Supervisors 1 Operators 1

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
	7:00 to 12:10	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>▲ Driltech rig was moved to location of DP-2 and set up for drilling.</li> <li>▲ Installed additional pumps to aid circulating water.</li> <li>▲ 11:40 the rig had a frozen hose and spent about 30 min. to straight it up.</li> </ul>
rock socket 131'4" to 136'5"	12:10 to 13:23	Limestone fine cuttings	Max Min Mean	N/A		<ul style="list-style-type: none"> <li>▲ 12:10-12:11 131'4"-132'5" Down press. 0"</li> <li>12:11-12:18 132'5"-133'5" "</li> <li>12:18-12:27 133'5"-134'5" "</li> <li>12:27-12:39 134'5"-135'5" "</li> </ul>
"	13:23 to 14:00	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>13:39-13:23 135'5"-136'5" (the last 2.5" down press. is 400psi)</li> <li>▲ Lunch break.</li> </ul>
"	14:00 to 16:40	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>▲ Withdrew the rods + bit.</li> <li>▲ Install the bailing bucket to the rig to clean the cuttings in the bottom of the rock socket.</li> <li>▲ 15:30 Tape measured the depth of the rock socket at 135'6".</li> </ul>
			Max Min Mean			<ul style="list-style-type: none"> <li>▲ After bailing, the bottom of the rock socket was tape measured again at 136'2"</li> </ul>
			Max Min Mean			END OF DRILLING FOR DP-2.
			Max Min Mean			
			Max Min Mean			

Note:

Page D-71 through Page D-104  
INSTALLATION LOG, PILE NO. DP3



D-71

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 11/17/79  
Observer JAH

INSTALLATION LOG, PILE NO. DP-3

Batter + V. to 1 H.  
G.S. Elevation ± 422 ft  
Weather Cold

Operating Crew: 1st shift  
Supervisors Armando Operators 2  
Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
N/A	7:00 to 8:30	N/A	Max	N/A	N/A	▲ Moving & aligning Benoto rig over DP-3. Moving 1st section of casing into position & making preparation for drilling
			Min			
			Mean			
A	8:30 to 11:10	N/A	Max	N/A	N/A	▲ placing 1st section of casing in place on rig and aligning it w/ transit, batter board & carpenter level. ▲ 2nd section of casing prepared for welding and placed alongside rig.
			Min			
			Mean			
			Max			▲ Anchored the rig to concrete mat. ▲ 7:30 to 10:10 WCC crew making readings on Borros points. ▲ Laborers cleaning & draining excavation for concrete mat of DP-4, 5, 6.
			Min			
			Mean			
Casing 14 Soil 4	11:10 to 11:30	N/A	Max	N/A	N/A	▲ Started initial pushing of casing. Casing pushed to 14 ft w/out excavating. ▲ stopped to weld on 2nd section. ▲ Removed 3 prong hammer grab and changed to large 2 prong hammer grab
			Min			
			Mean			
Casing 14 Soil 4	11:30 to 12:15	N/A	Max	N/A	N/A	▲ Lunch break.
			Min			
			Mean			
"	12:15 to 12:50	N/A	Max	N/A	N/A	▲ Installed large 2-prong hammer grab on Benoto rig.
			Min			
			Mean			
"	12:50 to 18:15	N/A	Max	N/A	N/A	▲ placed second section of casing in place and aligned it. ▲ Welding of the 2nd section in progress. ▲ Weighed Bin A + B for new true weights since repairing works and replacement of lifting hooks on Bins. New tare weights: Bin A - 455# Bin B - 492#
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note:

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 2 of 2  
Date 1/17/79  
Observer J. Harper

INSTALLATION LOG, PILE NO. DP-3

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 23.8	18:15	N/A	Max			▲ Advanced casing about excavating. ▲ At casing depth of 23'10", advancing became hard, indicating probable top of sand.
Soil	to		Min	N/A	N/A	
4	18:30		Mean			
Casing 23.8	18:30		Max			▲ Started to excavate. Only one bucket load removed. The excavated material consisted of plywood, bartop & plastic apparently from concrete mat construction along w/ a small amount of sandy clay & gravel.
Soil	to		Min	N/A		
4	19:00		Mean			
			Max			▲ The excavated materials got stuck in the bucket and some difficulty was experienced to extracting them and getting back into operation order. No additional excavation was done.
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note: 1) Excavation tool: large 2 prong hammer grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/17 - 1/18/79  
Observer D. TSO

INSTALLATION LOG, PILE NO. DP-3Batter 4 V. to 1 H.G.S. Elevation ±422ftWeather clearOperating Crew: 2<sup>nd</sup> shiftSupervisors 1 Operators 1Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 24 Soil 4	19:00 to 20:35	N/A	Max Min Mean	N/A	N/A	▲ 19:00 to 19:30 shift change of the operating crew. ▲ 19:30 to 20:20 Laborers reconnected all the hoses for recharging water. Waiting for fuel to put into water pump.
Casing 24 Soil 22	20:35 to 21:25	Grey clayey SILT.	Max Min Mean	N/A	24.0	▲ 20:20 to 20:35 pump water into casing. ▲ 20:35 Excavation started. ▲ 21:25 sand was noted in the cutting. Soil depth was measured at 22 ft.
Casing 26.5 Soil 24.1	21:25 to 22:25	Grey fine to med. SAND. trace coarse SAND, fine to med. gravel	Max Min Mean 600	1350	4.2	▲ 21:55 Casing @ 26'6". Soil @ 24'1". ▲ 21:55 to 22:25 shifted bin G which had been used to retain most of the clay cuttings. Bin A was set under the spout. ▲ Pumped water into casing to G.S. level.
Casing 30 Soil 26.4	22:25 to 22:55	"	Max Min Mean 600	1350	4.6	▲ 22:50 Casing @ 30'. Soil @ 26'5". Water level was 3 ft above G.S.
"	22:55 to 23:40	N/A	Max Min Mean	N/A	N/A	▲ Coffee break.
Casing 32.1 Soil 28.2	23:40 to 0:20	Grey fine to med. SAND. trace coarse sand + fine gravel.	Max Min Mean 700	1400	5.4	▲ 23:40 Soil @ 26'0". Water was added to 4 ft above G.S. ▲ 0:15 Soil @ 29'4". Casing was advanced to 32'1". ▲ 0:20 After advancing the casing, soil was measured at depth of 28'2".
"	0:20 to 7:00	N/A	Max Min Mean	N/A	N/A	▲ 0:20 to 1:15 Set up the 3 <sup>rd</sup> section in position and aligned it. ▲ 1:15 to 6:25 Welding + grinding in progress.
"			Max Min Mean			▲ 6:25 to 6:45 Moved away generator, heater and shed which were used in welding.

Note: (1) Excavation tool: large 2 prong hammer grab.

D-74

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 1/18/79  
Observer J. Harper

INSTALLATION LOG, PILE NO. OP-3Batter 4 V. to 1 H.G.S. Elevation ±422ft.Weather ColdOperating Crew: 1st shiftSupervisors 1 Operators 2Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 32.1 Soil 20.2	7:00 to 8:45	N/A	Max Min Mean	N/A	N/A	▲ Crew thawing out pumps, repairing water pipe connectors, and pumping water into casing. Water is 7 ft above ground surface. ▲ WCC personnel making instrumentation readings for 32 ft depth.
Casing 33.5 Soil 31.0	8:45 to 9:40	Gray silty fine SAND	Max Min Mean 900	1400	4.2	▲ Relatively easy pushing + excavating. ▲ Oscillation: 2" to 2½" w/ no rebound. ▲ Water is 5' above ground surface.
Casing 36. Soil 33.	9:40 to 10:15	Generally grey brown fine SAND. some coarse sand.	Max Min Mean 900	1350	4.0	▲ Relatively easy of pushing + excavating. ▲ Water 5 ft above ground surface.
"	10:15 to 10:55	N/A	Max Min Mean	N/A	N/A	▲ Moved Bin A to scales and weighed (cuttings from 24'1" to 33'0"). ▲ Moved Bin B to chute.
Casing 38.8 Soil 35.8	10:55 to 11:50	Grey brown med. to coarse SAND w/ minor amount of gravel.	Max Min Mean 900	1400	3.4	▲ Water is 5 ft above ground surface.
"	11:50 to 12:40	N/A	Max Min Mean	N/A	N/A	▲ Lunch break.
Casing 40.9 Soil 38.9	12:40 to 13:50	Med. to coarse SAND to ≈ 37, then fine SAND.	Max Min Mean 900	1400	2.9	▲ Water is 6' above ground surface.
"	13:50 to 14:30	N/A	Max Min Mean	N/A	N/A	▲ Repaired broken bolt on right thrust drive shaft.

Note:



D-75

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 1/18/79  
Observer J. Harper

INSTALLATION LOG, PILE NO. DP-3

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 44	14:30	Fine SAND to $\approx$ 40'	Max		3.5	Water is 5 ft above ground surface.
Soil	to	med. to fine SAND below	Min			
41.5	15:20	40'	Mean 900	1400		
Casing 45.2	15:20	Grey brown med. to fine SAND	Max		4.0	
Soil	to		Min			
42.5	15:40		Mean 900	1400		
"	15:40	N/A	Max		N/A	▲ Moved Bin B to scales & weighed. (cuttings from 33'0" to 42'6") ▲ Moved Bin A to chute.
"	to		Min	N/A		
"	15:45		Mean			
Casing 49.4	15:45	Grey brown med. to fine SAND	Max		2.4	
Soil	to		Min			
45.5	17:00		Mean 900	1400		
"	17:00	N/A	Max		N/A	▲ Prepared top of casing for new section. ▲ Placed the 4th section in position & prepared for welding.
"	to		Min	N/A		
"	19:00		Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note: n) Excavation tool: Large 2-prong hammer grab.

D-76

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/18-1/19/79  
Observer RQ

INSTALLATION LOG PILE NO. DP-3Batter 4 V. to 1 H.

Operating Crew:

G.S. Elevation ±422ftSupervisors 1 Operators 1

Weather \_\_\_\_\_

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 49.4 Soil	19:00	N/A	Max	N/A	N/A	▲ welding the 4 <sup>th</sup> section + grinding flush.
	to		Min			
	23:30		Mean			
"	23:30	N/A	Max	N/A	N/A	▲ No operation due to very hazardous working condition. (heavy rain, sleet + hail) ▲ WCC personnel took instrumentation readings.
	to		Min			
	5:45		Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note:



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 1/19/79  
Observer J. Harper

D-77

INSTALLATION LOG, PILE NO. DP-3

Batter 4 V. to 1 H.

G.S. Elevation ±422ft.

Weather \_\_\_\_\_

Operating Crew: 1st shift

Supervisors 1 Operators 2

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 49.4 Soil 45.1	7:00 to 9:30	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>starting + warming up equipment</li> <li>thawing ice from rig w/ torches.</li> <li>Very dangerous working conditions from sheet of ice on equipment + ground</li> <li>WCC personnel making instrumentation</li> </ul>
			Max Min Mean			<ul style="list-style-type: none"> <li>readings from 7:30 to 9:30.</li> <li>Water is 10' above ground surface.</li> </ul>
Casing 50.1 Soil 47.2	9:30 to 10:45	Grey brown fine to med. SAND.	Max Min Mean 900	1400	1.8	<ul style="list-style-type: none"> <li>Having trouble elevating bucket to chute to discharge cuttings. Some soil not going into chute + spilling on casing + collar clamp. Having to be scooped up by hand + shovel.</li> </ul>
			Max Min Mean			<ul style="list-style-type: none"> <li>No pushing or oscillating of casing during this period but casing settled ~ 2" under its own weight during excavation.</li> </ul>
"	10:45 to 12:00	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>Stopped excavating to have mechanic to work on rig to rectify the problem w/ the hammer grab.</li> </ul>
"	12:00 to 12:30	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>Lunch break.</li> </ul>
"	12:30 to 14:30	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>Continued working on rig. including cleaning out hydraulic lines + checking other items to try to get hammer grab elevating mechanism to work properly.</li> </ul>
	14:30 to 15:20	Gray brown fine to med. SAND.	Max Min Mean 1000	1400		<ul style="list-style-type: none"> <li>Resumed excavating + pushing casing</li> <li>Casing rotating ~ 2 1/4", rebound ~ 1/8"</li> </ul>

Note:

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 2 of 2  
Date 1/19/79  
Observer J. Harper

D-78

INSTALLATION LOG, PILE NO. DP-3

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
N/A	15:20 to 15:45	N/A	Max Min Mean	N/A	N/A	▲ Hammer grab not working properly. Attempting to get it fixed.
Casing SS.3 Soil SI.1	15:45 to 17:00	Gray brown fine to med. SAND.	Max Min Mean 1000		2.0	▲ Resumed operation. Hammer grab working better.
N/A	17:00 to 17:10	N/A	Max Min Mean	N/A	N/A	▲ Moved Bin A to scales and weighed Moved Bin B to chute.
Casing S6.6 Soil S4.0	17:10 to 18:30	Generally grey brown fine to med. SAND w/ some minor amount of small gravel at ~ 52' depth	Max Min Mean 1000		2.5	▲ A thin clay seam or lense was noted during excavating between 52' + 53', noted in only a couple of buckets.
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/19-1/20/79  
Observer R.Q.

D-79

INSTALLATION LOG, PILE NO. DP-3

Batter 4 V. to 1 H.

Operating Crew: 2nd Shift

G.S. Elevation = 422ft

Supervisors E. Bigaman Operators 2

Weather Partly cloudy + foggy, ~35°

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 60.1 Soil 58.1	19:00 to 20:35	Grey, fine to med. SAND. trace silt, trace fine gravel.	Max Min Mean 1100		4.1	Water is 4 ft above ground surface.
Casing 60.7 Soil 59.2	20:35 to 21:00	Grey, fine to coarse SAND trace silt, decayed wood fragments, trace fine gravel.	Max Min Mean 1100		3.2	
Casing 62.5 Soil 60.8	21:00 to 21:55	"	Max Min Mean 900		2.5	Water is 3 ft above ground surface.
Casing 66.1 Soil 61.7	21:55 to 22:50	"	Max Min Mean 900		1.7	Moved Bin B to scales and weighed. (cuttings from 52'1" to 60'10") Moved Bin A to chute. Water is 6 ft above ground surface.
N/A to 23:30	22:50 to 23:30	N/A	Max Min Mean	N/A	N/A	Coffee break.
Casing 67.1 Soil 64.4	23:30 to 1:05	Grey, fine to coarse SAND trace silt, some fine gravel.	Max Min Mean 900		2.2	Water is 3 ft above ground surface.
Casing 68.1 Soil 64.4	1:05 to 5:30	N/A	Max Min Mean 900		N/A	1:05 to 1:15 Advanced casing to 68.1' and ready to receive the 5th section. Prepared for welding the 5th section. 1:15 to 5:30 welding the 5th section + grinding flush.
Casing 68.1 Soil 65.6	5:30 to 6:35	Grey, fine to med. SAND trace silt, trace fine gravel.	Max Min Mean 900		2.0	Water is 10 ft above ground surface. Ground water table is 26 ft below G.S.

Note: (1) Excavation tool: Large 2 prong hammer grab

D-80

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 1/20/79  
Observer J. Harper

INSTALLATION LOG, FILE NO. DP-3Battery 4 V. to 1 H.Operating Crew: 1<sup>st</sup> shiftG.S. Elevation ±422ftSupervisors 1 Operators 2Weather clear, cold 30°-35°FLaborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 68.1	7:00	N/A	Max		N/A	▲ Repairing hose connection for water to rig.
Soil	to		Min	N/A		▲ WCC personnel making instrumentation measurements for 68' depth
64.5	8:15		Mean			
Casing 71.1	8:15	Grey brown med. to fine SAND, trace silt, small amount of gravel to	Max		2.8	▲ Water 15-12' above ground surface
Soil	to		Min			
66.8	9:05		Mean 950	1400		
Casing 72.6	9:05	1" + 2" size Grey brown med. SAND, trace silt, minor amount of gravel.	Max		1.6	▲ 10:00 Moved Bin A to scales + weighed
Soil	to		Min			Moved Bin B to chute.
69.6	10:20		Mean 1100	1450		▲ Water is 10 ft above ground surface.
Casing 75	10:20	Grey brown fine to coarse SAND, trace silt	Max		2.4	▲ Water is 8 ft above ground surface.
Soil	to		Min			
72	11:20		Mean 1100	1400		
	11:20	"	Max			▲ Casing rotates ~ 2 to 2 1/2° and rebounds ~ 1/4°.
	to		Min			
	11:45		Mean 1100	1400		
N/A	11:45	N/A	Max		N/A	▲ Lunch break.
	to		Min	N/A		
	12:30		Mean			
Casing 77.7	12:30	Grey brown med. to fine SAND, trace silt.	Max			▲ Water is 6 ft above ground surface
Soil	to		Min			
74.1	13:25		Mean 1200	1400		
Casing 79.2	13:25	Grey brown fine to med SAND, trace silt, minor amount of peat.	Max		2.1	▲ Water is 5 ft above ground surface
Soil	to		Min			
76.2	14:35		Mean 1200	1400		

Note



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 2 of 2  
Date 1/20/79  
Observer J. Harper

D-81

INSTALLATION LOG. PILE NO. DP-3

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 80.2 Soil 78.3	14:35 to 15:45	Grey brown med. to fine SAND. w/ small amount of angular gravel.	Max Min Mean 1150	  1400	2.0	
N/A	15:45 to 16:20	N/A	Max Min Mean	 N/A  	N/A	▲ Moved Bin B to scales and weighed. ▲ Moved Bin A to chute.
Casing 82.1 Soil 79.	16:20 to 16:40	Grey brown med. to fine SAND trace silt.	Max Min Mean 1150	  1400	2.0	▲ Casing rotates ~ 2" rebounds ~ 1/4"
N/A	16:40 to 17:30	N/A	Max Min Mean	 N/A  	N/A	▲ Rig shut down due to broken guide ring on hammer grab. Welder made repairs. ▲ Water is 5 ft above ground surface.
Casing 83.3 Soil 81.0	17:30 to 18:40	Silty fine SAND.	Max Min Mean 1150	  1400	2.2	▲ Water is 3 ft above ground surface.
			Max Min Mean	  		
			Max Min Mean	  		
			Max Min Mean	  		

Note: (1) Excavation tool: Large 2 prong hammer grab.

D-82

WOODWARD-CLYDE CONSULTANTS

LOCKS AND DAM NO. 26

DRILLED-IN PILE TEST

P. 1 of 1Date 1/20 - 1/21/79Observer R. Q.INSTALLATION LOG, PILE NO. DP-3Batter 4 V. to 1 H.G.S. Elevation ±422ftWeather Partly cloudy -30°Operating Crew: 2nd shiftSupervisors E. Bigaman Operators 2Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 83.3	19:00	Grey fine SAND	Max			▲ Spent about 1 hour in thawing ice and pumping water into casing.
Soil	to	trace silt, trace fine gravel.	Min		1.6	▲ Water is 2 ft above ground surface
82.6	21:00		Mean 900	1500		
Casing 84.2	21:00		Max			▲ Water is 2 ft above ground surface.
Soil	to	"	Min		0.5	▲ 21:00 - 21:30 Coffee break.
82.8	21:55	(dense)	Mean 900	1500		
Casing 84.2	21:55		Max			▲ 15 min. spent in pumping water into casing.
Soil	to	"	Min N/A		1.3	▲ Water is 2 ft below ground surface.
83.8	22:55		Mean			
N/A	22:55 to 7:00	N/A	Max		N/A	▲ Prepared for the welding of the 6 <sup>th</sup> section.
			Min N/A			▲ Welding the 6 <sup>th</sup> section + grinding flux.
			Mean			▲ WCC personnel took instrumentation readings between 0:00 and 11:00.
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.



D-83

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 1/22/79  
Observer J. Harper

INSTALLATION LOG, PILE NO. DP-3Batter 4 V. to 1 H.G.S. Elevation ±422ftWeather clear, coldOperating Crew: 1st shiftSupervisors E. Bigaman Operators 2Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 86 Soil 82.2	7:00 to 8:00	N/A	Max Min Mean	N/A	N/A	▲ 7:00 Water level 11 ft below ground surface. ▲ Measurement showed that soil depth was 1' 8" higher than at end of Saturday night shift.
Casing 86 Soil 85	8:00 to 9:10	Grey brown fine to coarse SAND. some small gravel.	Max Min Mean 1100	1400	3.2	▲ 7:00 to 8:00 start up time. ▲ First six hammer grab bucket loads excavated were grey fine sand & silt, which apparently sediment from casing water during weekend shutdown.
			Max Min Mean			▲ Slipping between clamp and casing. Very little vertical or rotary movement of the casing was obtained. Rotation ~ 3/4". rebound ~ 1/4". ▲ Water is 11 ft above ground surface.
	9:10 to 9:25	"	Max Min Mean 1100	1400		▲ clamp slipping on casing. Rotation ~ 1/2 to 3/4" rebound ~ 1/4". ▲ 9:25 stopped to weld beads on clamp for better grip.
N/A	9:25 to 11:20	N/A	Max Min Mean	N/A	N/A	▲ Welded beads on clamp. ▲ cherry picker raised a shed onto rig platform to protect laborer from cold & ice while helping to remove material from bucket.
	11:20 to 11:40	Grey brown fine to coarse SAND trace silt, some small gravel.	Max Min Mean 1150	1400		▲ Beads welded to casing assisted in getting casing moving. oscillation ~ 2". rebound ~ 1/4"
N/A	11:40 to 12:35	N/A	Max Min Mean	N/A	N/A	▲ Lunch break.
Casing 89.5 Soil 87.	12:35 to 13:45	Grey brown fine to coarse SAND trace gravel	Max Min Mean 1150	1400	1.2	▲ Excavation & advancing casing going satisfactorily ▲ 13:10 ~ 13:45 Made modification to shed on platform. -bucket. ▲ chute struck the top when raising to empty

Note:

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 2 of 2  
Date 1/22/79  
Observer J. Harper

D-84

INSTALLATION LOG PILE NO. DP-3

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 90.2 Soil 88.7	13:45 to 14:55	Grey brown fine to coarse SAND some small gravel	Max Min Mean 1200		1.7	▲ Water is 1 ft above ground surface ▲ WCC personnel checking inclinometer readings done on Sunday morning (1/21/79)
Casing 92.7 Soil 89.7	14:55 to 16:00	Grey brown fine to coarse SAND some gravel	Max Min Mean 1250		1.2	▲ Casing oscillation ~ 2 1/4" rebound ~ 1/4" ▲ Water is 1 ft above ground surface and then filled to 12 ft above ground surface.
Casing 91.9 Soil 91.3	16:00 to 17:05	Grey brown fine to coarse SAND some gravel	Max Min Mean 1100		1.7	
Casing 95.2 Soil 92.9	17:05 to 18:15	Grey brown fine to coarse SAND	Max Min Mean 1100		1.7	▲ Moved Bin B to scales and weighed. ▲ Moved Bin A to chute.
Casing 95.2 Soil 93.6	18:15 to 18:50	"	Max Min Mean 1100		1.3	▲ Water is 5 ft above ground surface
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.



D-85

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/22-1/23/79  
Observer R. Q.

INSTALLATION LOG, PILE NO. DP-3Battery 4 V. to 1 H.G.S. Elevation ±422ftWeather cloudy, windy, ~29°Operating Crew: 2nd shiftSupervisors A. Fabro Operators 2Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 98.2 Soil 96	19:00 to 21:00	Grey fine to med. SAND. trace silt. some fine gravel + white shell fragment	Max 800 Min 700 Mean	1400 1300	3.2	▲ 19:00-20:00 Delayed the hammer grab mechanism. ▲ Water is 5ft above ground surface.
N/A	21:00 to 21:15	N/A	Max Min Mean	N/A	N/A	
Casing 99.3 Soil 98	21:15 to 22:10	Grey fine to med. SAND. trace silt. trace fine gravel.	Max 800 Min 700 Mean	1400 1300	2.7	▲ Slipping between clamp + casing. Operation stopped at 22:10 for welding the clamp to the casing.
N/A	22:10 to 0:15	N/A	Max Min Mean	N/A	N/A	▲ Welding of the clamp to the casing in progress. ▲ 23:00 to 23:30 Lunch break
Casing 102.5 Soil 100.7	0:15 to 2:05	Grey fine to med. SAND. trace silt. trace fine gravel.	Max 800 Min 700 Mean	1400 1300	2.7	
Casing 104 Soil 100.7	2:05 to 2:30	N/A	Max Min Mean	N/A	N/A	▲ Advanced the casing from 102.5ft to 104 ft
N/A	2:30 to 4:00	N/A	Max Min Mean	N/A	N/A	▲ Preparation for the welding of the 7th section ▲ 3:00 to 3:30 Coffee break
N/A	4:00 to 7:00	N/A	Max Min Mean	N/A	N/A	▲ Welding of the 7th section in progress. ▲ Ground water table at 25'8" below ground surface.

Note: 1) Excavation tool: Large 2 prong hammer grab.

D-86

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/23/79  
Observer J. Harper

INSTALLATION LOG, PILE NO. DP-3

Batter 4 V. to 1 H.

Operating Crew: 1st shift

G.S. Elevation ±422ft.

Supervisors E. Bigaman Operators 2

Weather morning: Overcast, freezing rain, afternoon: snow, cold Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 104 Soil 100.2	7:00 to 11:00	N/A	Max Min Mean	N/A	N/A	▲ Completed the welding of the 7th section and ground the weld smooth. ▲ 9:20 to 10:55 Moving away welders' shed, replacing rig platform into operation position, pumping water into casing, preparing for operation. ▲ 8:00~10:00 WCC personnel making instrument reading per the schedule for 104 ft depth ▲ Water is 12 ft above ground surface.
Casing 104 Soil 101.4	11:00 to 11:40	Grey brown fine to coarse SAND. w/ minor amount of small gravel	Max Min Mean 1100	1400	2.1	▲ Tried to advance the casing, but the clamp was slipping. stopped trying to move casing and continued excavating. ▲ Water is 12 ft above ground surface
N/A	11:40 to 12:15	N/A	Max Min Mean	N/A	N/A	▲ Lunch break.
N/A	12:20 to 1:00	N/A	Max Min Mean	N/A	N/A	▲ Because of the snow + icy conditions, the contractor shut down the job for the remainder of the shift. The second shift is still scheduled if sufficient personnel show up.
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note 1) Excavation tool: Large 2 prong hammer grab.



D-87

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/23-1/24/79  
Observer R.Q.

INSTALLATION LOG, PILE NO. DP-3Batter 4 V. to 1 H.Operating Crew: 2<sup>nd</sup> shiftG.S. Elevation ±422ft.Supervisors 1 Operators 2Weather snow, hail + freezing rain -16°Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 104 Soil 101.4	19:00 to 20:30	N/A	Max Min Mean	N/A	N/A	▲ Job shut down due to bad and freezing weather conditions.
Casing 104.6 Soil 102.5	20:30 to 23:00	Grey fine to coarse sand trace silt. some fine gravel.	Max Min Mean 800	1300	0.7	▲ Contractor's field engineer decided to operate the rig by himself. ▲ Water is 3 ft above ground surface. ▲ Having problems w/ the frozen rig components.
N/A	23:00 to 7:00	N/A	Max Min Mean	N/A	N/A	▲ Job shut down due to the bad weather conditions.
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.

D-88

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/24/79  
Observer J. Harper

INSTALLATION LOG, PILE NO. DP-3Batter 4 V. to 1 H.Operating Crew: 1st shiftG.S. Elevation ±422ftSupervisors 1 Operators 2Weather Very cold, icyLaborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 105.3 Soil 102.3	7:00 to 8:30	N/A	Max Min Mean	N/A	N/A	▲ Measured soil, water depth. ▲ Thawing out equipments. ▲ The contractor closed down the whole site and called off all shifts until 0700 25 January because of extreme cold, wind + ice.
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note:



D-89

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 1/25/79  
Observer J. Harper

INSTALLATION LOG, PILE NO. DD-3

Batter 4 V. to 1 H.

Operating Crew: 1st shift

G.S. Elevation ±422ft

Supervisors 1 Operators 2

Weather clear, cold (~10°F @ 0700)

Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 105.3	7:00	N/A	Max		N/A	▲ Water is 20 ft below ground surface. ▲ Starting equipment, getting pump from storage to site, thawing frozen pipe & valve at water storage tank. filling casing w/ water to ~13 ft above ground surface. clearing area for movie.
Soil	to		Min	N/A		
102.3	9:20		Mean			
Casing 108.2	9:20	Grey brown fine to coarse SAND. some small gravels.	Max		2.4	▲ While advancing casing, clamp slipped some (~1/2") on casing. Rotation ~ 1 1/2" rebound ~ 1/4". Later, little slippage, rotation ~ 2" rebound ~ 1/2".
Soil	to		Min			
104.5	10:20		Mean	1250	1450	
Casing 110.2	10:20	" some small amount of coal up to ~2" size	Max		1.7	▲ Excavation + advancing casing going well. ▲ clamp slipping ~ 1/2" on casing. casing rotating ~ 1 1/2" to 2" rebound ~ 1/2".
Soil	to		Min			
106.7	11:45		Mean	1250	1400	
N/A	11:45	N/A	Max		N/A	▲ Lunch break
to			Min	N/A		
12:30			Mean			
N/A	12:30	N/A	Max		N/A	▲ Removing shed from Benoto rig in preparation for movies of drilled-in pile operation. ▲ Painting foot-mark on the 8th section of casings.
to			Min	N/A		
12:55			Mean			
Casing 111.5	12:55	Grey brown med. to fine SAND occasional small gravel ~ 1/2" size.	Max		1.1	▲ Water is 10 ft above ground surface
Soil	to		Min			
107.8	14:05		Mean	1250	1450	
Casing 113	14:05	Grey brown med. to fine SAND	Max		1.3	▲ Movie personnel taking movie of Benoto rig operating + attachments.
Soil	to		Min			
108.6	14:45		Mean	1300	1400	
N/A	14:45	N/A	Max		N/A	▲ Stopped to remove canvas cover from cab + prepared for movie shots of cab + cable drums + winches
to			Min	N/A		
15:15			Mean			

Note:

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 1/25/79  
Observer J. Harper

D-90

INSTALLATION LOG, PILE NO. DP-3

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 113 Soil 110.2	15:15 to 16:35	Grey brown med. to fine SAND.	Max Min Mean	N/A	2.5	15:30-15:55 Reinstalling cover canvas around operators area, and reinstalling shed on platform, which were removed for movie. 16:25-16:35 Moved Bin A to scales and weighed. Moved Bin B to chute. Water is 7 ft above ground surface.
Casing 114.7 Soil 111.1	16:35 to 17:35	Grey brown med. to fine SAND w/ a few small gravels (very scattered)	Max Min Mean		1.0	
Casing 115.4 Soil 112.8	17:35 to 18:50	Grey brown med. to fine SAND w/ occasional small gravels	Max Min Mean		1.8	
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note: 1) Excavation tool: Large 2 prong hammer grab.



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/25 ~ 1/26/79  
Observer R.Q.

INSTALLATION LOG, PILE NO. OP-3

Batter 4 V. to 1 H.

Operating Crew: 2nd shift

G.S. Elevation ±422ft.

Supervisors F. Armand Operators 2

Weather clear to partly cloudy, snow at 0500.

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 117.2	19:00	Grey fine to coarse sand, trace silt, some fine to coarse gravel w/ cobble	Max		1.7	▲ Water is 5 ft above ground surface.
Soil	to		Min			
114.6	20:20		Mean 900	1400		
Casing 118	20:20	"	Max		1.3	
Soil	to		Min			
115.4	21:10		Mean 900	1400		
N/A	21:35	N/A	Max		N/A	▲ Repairing the clamp.
	to		Min N/A			
	21:55		Mean			
Casing 120.2	21:55	Grey fine to coarse sand, trace silt, some fine to coarse gravel + cobble	Max		2.0	▲ 23:00 ~ 23:40 Lunch break. ▲ Water is 3 ft above ground surface.
Soil	to		Min			
119.3	0:25		Mean 800	1400		
Casing 122	0:25	N/A	Max		N/A	▲ Advancing casing w/o excavation
Soil	to		Min N/A			
119.3	0:40		Mean			
N/A	1:10	N/A	Max		N/A	▲ Preparation for welding of the 8th section.
	to		Min N/A			
	3:00		Mean			
N/A	3:00	N/A	Max		N/A	▲ Completed the welding of the 8th section
	to		Min N/A			
	7:00		Mean			
			Max			
			Min			
			Mean			

Note (1) Excavation tool: Large 2 prong hammer grab.

D-92

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 20  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 1/26/79  
Observer J. Harper

INSTALLATION LOG, PILE NO. DP-3Batter 4 V. to 1 H.G.S. Elevation ±422ftWeather Cold, snowingOperating Crew: 1st shiftSupervisors 1 Operators 2Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 122 Soil 118.	7:00 to 11:05	N/A	Max Min Mean	N/A	N/A	▲ No operation. WCC personnel making instrumentation readings. ▲ Pumping water into casing.
Casing 122 Soil 119.5	11:05 to 11:40	Grey brown med to coarse sand and gravel w/ some small cobbles to 4" size.	Max Min Mean	N/A	3.0	
N/A	11:40 to 12:35	N/A	Max Min Mean	N/A	N/A	▲ Lunch break.
Casing 122 Soil 120.7	12:35 to 13:05	Grey brown med to coarse sand + gravel w/ occasional small cobbles	Max Min Mean		2.3	▲ Attempted to advance casing, but clamp slipped w/o moving the casing. ▲ Water is 7 ft above ground surface.
N/A	13:05 to 16:25	N/A	Max Min Mean	N/A	N/A	▲ Welding beads on casing to increase clamp grip in order to move casing. Beads stripped off in attempts of turning the casing. ▲ Welded clamp to casing but weld broke in trying to push down + turn.
			Max Min Mean			▲ clamp again welded to casing + casing pulled up about 5", then pushed down while oscillating and successfully moved casing down.
Casing 123.3 Soil 121.5	16:25 to 17:25		Max Min Mean		0.8	▲ At 17:20 clamp would not hold to push down again. Stopped to weld clamp to casing again @ 17:25. ▲ Water is 10 ft above ground.
N/A	17:25 to 18:10	N/A	Max Min Mean	N/A	N/A	▲ Welded clamp to casing to facilitate rotating + pushing of the casing.

Note:



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 2 of 2  
Date 1/26/79  
Observer J. Harper

INSTALLATION LOG PILE NO. DP-3

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 123.9 50:1 122.7	18:10 + 19:00	Grey brown fine to coarse SAND, trace silt and small amount of gravel.	Max Min Mean 1200	Max Min Mean 1400		Started pushing casing down at 18:10 - weld held and casing pushed ~ 8", then started excavating.
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.

D-94

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/26 ~ 1/27/79  
Observer R.O.

INSTALLATION LOG, PILE NO. DP-3

Batter 4 V. to 1 H.

G.S. Elevation ±422ft

Weather Partly cloudy, snow flurries started @ 2200

Operating Crew: 2<sup>nd</sup> shift

Supervisors E. Armando Operators 2

Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 123.9 Soil 122.7	19:00 to 20:10	Grey fine to coarse sand, trace silt, some fine to coarse gravel	Max Min Mean			▲ Clamp weld broke. It was rewelded to the casing.
Casing 125.6 Soil 122.7	20:10 to 20:30	N/A	Max Min Mean	N/A	N/A	▲ Hard to rotate and push the casing. Casing advanced 1'7" w/o excavation.
N/A	20:30 to 24:00	N/A	Max Min Mean	N/A	N/A	▲ The weld broke. Rewelding completed at 2400. ▲ 23:00 - 23:30 Lunch break.
Casing 125.6 Soil 123.7	24:00 to 0:30	Grey fine to coarse sand, trace silt, some fine to coarse gravel	Max Min Mean	N/A	1.8	▲ Water is 4 ft above ground surface
Casing 125.6 Soil 124.8	1:00 to 1:25	Grey coarse to fine sand, trace silt, some fine to coarse gravel	Max Min Mean	N/A	3.0	▲ Ground water table is 25'7" below ground surface. ▲ The weld broke as soon as torque was applied to the casing.
N/A	1:25 to 7:00	N/A	Max Min Mean	N/A	N/A	▲ The poor gripping was caused by the wearing out of the beads on the steel plate of the clamp. Moved the rig back and opened the clamp collar so that new beads could be welded on the clamp.
			Max Min Mean			▲ Welding the beads in progress.
			Max Min Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.



D-95

WOODWARD-CLYDE CONSULTANTS

LOCKS AND DAM NO. 26

DRILLED-IN PILE TEST

P. 1 of 2Date 1/27/79Observer J. HarperINSTALLATION LOG, PILE NO. OP-3Batter 4 V. to 1 H.G.S. Elevation ±422ftWeather cold, snowingOperating Crew: 1st ShiftSupervisors 1 Operators 2Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
N/A	7:00	N/A	Max		N/A	▲ Welding points on inside of clamp collar
	to		Min	N/A		▲ Moving rig back into position, reassembling clamp.
	11:45		Mean			▲ Welding clamp to casing.
N/A	11:45	N/A	Max		N/A	▲ Lunch break
	to		Min	N/A		
	12:30		Mean			
Casing 127.6 Soil 123.5	12:30	N/A	Max		N/A	▲ Continued welding clamp to casing (completed 13:05)
	to		Min	N/A		▲ Pumped water into casing.
	13:20		Mean			▲ Prepared for operation.
N/A	13:20	N/A	Max		N/A	▲ Operator tried to oscillate casing, clamp and weld held, but pipe friction was so great that the rear of the machine oscillated and the casing didn't move.
	to		Min			▲ The superintendent sent for the bucket loader and attempted to use it to anchor the rear end of the rig.
	15:35		Mean 1500	1400		▲ The bucket loader arrived, but in getting near the rig, its bucket teeth broke off a hydraulic valve on the rig.
			Max			▲ A plug was located, and the welder fabricated a repairs. Then the bucket loader was fastened to the rear end of the rig.
			Min			▲ The operator attempted to oscillate the casing. The welds held and the bucket loader successfully anchored the rig, but the torque pressure of 1500 psi was very high. The superintendent stopped the oscillation operation although the casing was moving.
			Mean			
			Max			▲ The superintendent called the mechanic in Kentucky for advice, and was advised not to use more than 1400 to 1500 torque pressure.
			Min			
			Mean			

Note:

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 2 of 2  
Date 1/27/79  
Observer J. Harper

INSTALLATION LOG, PILE NO. DP-3

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 127.7 Soil 125.1	15:35 to 16:15	Grey brown fine to coarse SAND, w/ some gravel and a few small cobbles to 3" size.	Max Min Mean 1200		3.8	▲ Oscillated + pushed casing and excavated soil from casing.
N/A	16:15 to 16:40	N/A	Max Min Mean	N/A	N/A	▲ Added water into casing. Pump starter rope broke and had to be repaired.
Casing 122.9 Soil 125.1	16:40 to 16:55	Grey brown med. to coarse SAND w/ scattered gravel	Max Min Mean 1200			▲ 2 buckets excavated. ▲ Rotated + pushed casing. ▲ Water is 10 ft above ground surface.
N/A	16:55 to 18:10	N/A	Max Min Mean	N/A	N/A	▲ Welded casing to clamp after clamp was moved to higher spot on the casing for further advancement. ▲ Move Bin A to scales + weighed ▲ Move Bin B to chute.
Casing 128.9 Soil 126.1	18:10 to 18:50	Grey brown med. to coarse SAND, w/ scattered gravel.	Max Min Mean 1300			▲ Excavating + oscillating + pushing casing. Bucket loader anchoring rear of rig. ▲ Casing rotating ~ 2". rebound ~ 1/2".
			Max Min Mean			
			Max Min Mean			
			Max Min Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.



D-97

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 1  
Date 1/27 ~ 1/28/79  
Observer R.Q.

INSTALLATION LOG, PILE NO. DP-3Batter 4 V. to 1 H.G.S. Elevation ±422ftWeather Partly cloudy, av wind chill factor to -9°

Operating Crew:

Supervisors 1 Operators 2Laborers 2 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 128.8 Soil 128.0	19:00 to 20:25	Grey fine to coarse sand trace silt, trace fine gravel.	Max Min Mean	N/A		▲ Water is 5 ft above ground surface.
Casing 130.2 Soil 128.0	20:25 to 20:35	N/A	Max Min Mean		N/A	▲ Advanced casing without excavation ▲ Bucket loader was used to keep rig from moving due to twisting & pushing the casing.
Casing 130.2 Soil 128.8	20:35 to 21:15	Grey fine to coarse sand trace silt, some fine to coarse gravel w/ cobbles.	Max Min Mean		1.0	▲ Water is 5 ft above ground surface.
N/A	21:15 to 23:00	N/A	Max Min Mean	N/A	N/A	▲ welding clamp to casing.
N/A	23:00 to 23:30	N/A	Max Min Mean	N/A	N/A	▲ Lunch break.
Casing 130.2 Soil 129.2	23:30 to 0:15	Grey fine to coarse sand trace silt, some coarse to fine gravel cobbles.	Max Min Mean	N/A	0.8	▲ Water is 5 ft above ground surface ▲ Ground water table is 25" below ground surface.
Casing 131 Soil 129.2	0:30 to 7:00	N/A	Max Min Mean		N/A	▲ Replaced 2 prong hammer grab w/ 3 prong hammer grab. It was bringing only one or two pieces of cobble up. Replaced it w/ rock chisel but it was then found that the outer ring of the rock chisel was about the same dimension as the inside diameter of the casing and needed to be trimmed. It was replaced again w/ 3 prong hammer grab. Recovery was still very poor. ▲ Reduction of the dimension of the outer ring of the rock chisel was completed.
			Max Min Mean			

Note: (1) Excavation tool: Large 2 prong hammer grab.  
3 prong hammer grab.  
Rock chisel.

WCC, Y7C928 Phase IV

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 3Date 1/29/79Observer J. HarperINSTALLATION LOG, PILE NO. DP-3Batter 4 V. to 1 H.G.S. Elevation ±422ft.Weather clear, cold.Operating Crew: 1st shiftSupervisors 2 Operators 1Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 131 Soil 129.2	7:00 to 10:55	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>starting equipment, thawing out water lines, welding clamp to casing, filling up empty water storage tank.</li> <li>Water is 10 ft below ground surface at 0700. It was filled to 13 ft above ground surface.</li> </ul>
N/A	10:55 to 11:20	Large gravel, small cobbles + fractured rock from cobbles + limestone	Max Min Mean	N/A		<ul style="list-style-type: none"> <li>Low percentage recovery from the 3 prong hammer grab, small amount of gravel + small cobbles to ~3" size.</li> <li>Replaced the 3 prong hammer grab w/ rock chisel.</li> </ul>
N/A	11:20 to 11:40	N/A	Max Min Mean	N/A		<ul style="list-style-type: none"> <li>Installing rock chisel.</li> </ul>
	11:40 to 11:50	N/A	Max Min Mean	N/A		<ul style="list-style-type: none"> <li>Lowered chisel to bottom of casing, then raised and dropped it from ~3 to 5 ft above the soil + rock in the bottom of the casing. Marks on casing indicated that the chisel penetrated ~3"</li> </ul>
N/A	11:50 to 12:30	N/A	Max Min Mean	N/A		<ul style="list-style-type: none"> <li>Lunch break.</li> </ul>
Casing 131	12:30 to 13:00	N/A	Max Min Mean	N/A		<ul style="list-style-type: none"> <li>Continued using rock chisel. Stopped at 1300 to change to hammergrab.</li> </ul>
"	13:00 to 15:17	N/A	Max Min Mean	N/A		<ul style="list-style-type: none"> <li>changed from rock chisel to 2 prong hammer grab to retrieve cuttings from rock chisel.</li> </ul>
Casing 131 Soil 130.2	13:17 to 14:12	Gravel + cobbles, med. to coarse SAND.	Max Min Mean	N/A	1.1	<ul style="list-style-type: none"> <li>Excavated. First 2 bucket loads contained only some gravel + small cobbles. Subsequent buckets contained med. to coarse SAND + gravel + fragmented rock from broken cobbles.</li> </ul>

Note:



WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

D-99

P. 2 of 3  
Date 1/29/79  
Observer J. Harper

INSTALLATION LOG, PILE NO. DP-3

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
N/A	14:12 to 14:25	Gravel + cobbles + med. to coarse SAND w/ some stone chip fragments.	Max Min Mean	N/A	1.2	
Casing 131.2 Soil 130.5	14:25 to 15:00	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>Measured depth of soil (rock)</li> <li>Got bucket loader to anchor rear of rig in preparation of oscillating + pushing casing into bedrock.</li> </ul>
	15:00 to 15:25	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>Oscillated + pushed casing into limestone bedrock. Last 5 min. essentially no downward movement.</li> <li>Rotation ~ 1 3/4". rebound ~ 3/4".</li> </ul>
			Max Min Mean			<ul style="list-style-type: none"> <li>15:25 the bracing to the oscillation piston on the right side of the rig broke. Casing @ 131' 8", approximately 1' 2" into bedrock.</li> <li>Stopped to change to rock chisel + move cuttings bin.</li> </ul>
Casing 131.7 Soil 130.5	15:25 to 15:55	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>Moved Bin B to scales + weighed</li> </ul>
	15:55 to 16:55	N/A	Max Min Mean	N/A		<ul style="list-style-type: none"> <li>Used rock chisel to attempt to drill rock socket.</li> <li>Mark on cable indicated chisel extending ~ one ft into rock.</li> <li>Stopped to put on hammer grab to retrieve cuttings.</li> </ul>
N/A	16:55 to 17:10	N/A	Max Min Mean	N/A	N/A	<ul style="list-style-type: none"> <li>changed from chisel to large 2 prong hammer grab.</li> </ul>
	17:10 to 17:45	Lime slurry, small limestone chips to ~ 1" max. size	Max Min Mean	N/A	2.6	<ul style="list-style-type: none"> <li>Excavated cuttings from chisel</li> </ul>

Note:

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 26  
DRILLED-IN PILE TEST

P. 3 of 3  
Date 1/29/79  
Observer \_\_\_\_\_

INSTALLATION LOG, PILE NO. DP-3

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 131.7	17:45	N/A	Max		N/A	▲ changed from hammer grab to chisel.
Soil (Rock)	to		Min	N/A		
132.0	18:05		Mean			
	18:05	N/A	Max		N/A	▲ used chisel in rock socket. ▲ Cable marks indicate chisel dug ~ 6 more inches.
	to		Min	N/A		
	18:45		Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			
			Max			
			Min			
			Mean			

Note: Excavation tool: Rock chisel.  
Large 2 prong hammer grab.  
3 prong hammer grab.



D-101

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 1/29-1/30/79  
Observer R.Q.

INSTALLATION LOG, PILE NO. DP-3Batter 4 V. to 1 H.G.S. Elevation ±422ftWeather Partly cloudy 13°-15°Operating Crew: 2<sup>nd</sup> shiftSupervisors 1 Operators 1Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
N/A	19:00	N/A	Max		N/A	▲ shift change of the operating crew.
	to		Min	N/A		
	20:00		Mean			
	20:00		Max			▲ Breaking bedrock by rock chisel.
	to		Min	N/A		
	21:00		Mean			
	21:00		Max			▲ Installed bailing bucket to Benoto rig.
	to		Min	N/A		
	21:15		Mean			
	21:15	Limestone rock chips	Max			▲ Retrieved cuttings by bailing bucket Only few limestone chips recovered. ▲ Removed bailing bucket.
	to		Min	N/A		
	21:45		Mean			
Casing 131.7 Soil 132	21:45		Max			▲ Installed rock chisel to Benoto rig.
	to		Min	N/A		
	22:10		Mean			
	22:10		Max			▲ Breaking bedrock by rock chisel.
	to		Min	N/A		
	23:00		Mean			
N/A	23:00	N/A	Max		N/A	▲ Lunch break.
	to		Min	N/A		
	23:30		Mean			
	23:30		Max			▲ Continued excavation by rock chisel.
	to		Min	N/A		
	0:00		Mean			

Note:

D-102

WOODWARD-CLYDE CONSULTANTS  
 LOCKS AND DAM NO. 26  
 DRILLED-IN PILE TEST

P. 2 of 2  
 Date 1/29-1/30/79  
 Observer R.Q.

INSTALLATION LOG, PILE NO. DP-3

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
N/A	0:00 to 0:20	N/A	Max	N/A	N/A	▲ Removed rock chisel and installed bailing bucket.
	Min					
	Mean					
	0:20 to 0:35		Max	N/A		▲ Recovered cutting included lime slurry and rock fragment. ▲ Removed bailing bucket.
	Min					
	Mean					
Casing 131.7 rock 132.2	0:35 to 0:40		Max			▲ Measured casing + rock depth
	Min					
	Mean					
N/A	0:40 to 2:15	N/A	Max	N/A	N/A	▲ Moved Berto rig away from DP-3 position.
	Min					
	Mean					
			Max			
	Min					
	Mean					
			Max			
	Min					
	Mean					
			Max			
	Min					
	Mean					

Note: Excavation tool: Rock chisel.  
 Bailing bucket.



D-103

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 1 of 2  
Date 1/30/79  
Observer J. Harper

INSTALLATION LOG, PILE NO. DP-3Batter 4 V. to 1 H.Operating Crew: 1st shiftG.S. Elevation ±422ft.Supervisors 2 Operators 1Weather Cold, snowing.Laborers 3 Others 1

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
Casing 131.7 Rock 132.1	7:00 to 7:45	N/A	Max Min Mean	N/A	N/A	▲ Water level in the casing is 26'8" below ground surface. ▲ Benoto rig assisted by bucket loader moved clear of the area for the Driltech rig to get into position.
N/A	7:45 to 9:55	N/A	Max Min Mean	N/A	N/A	▲ Driltech rig moving into position over DP-3, changing fittings on rig, and preparing to drill rock socket. ▲ Water line being run to site.
			Max Min Mean			▲ Driltech rig having difficulty setting the appropriate angle for alignment of drill rod to parallel the 4:1 casing of DP-3. Driltech superintendent said the hoisting frame was apparently bent during pulling casing for the rock anchor job. Cutting torch used to align bolt holes.
	9:55 to 10:45	N/A	Max Min Mean	N/A	N/A	▲ Placed tricone bit into casing + started coupling drill rods. Very slow process. ▲ Bit seated on top of rock at 1045.
	10:45 to 11:56		Max Min Mean	N/A		▲ Measured and made marks on drill rod. Drilling started at 1046. ▲ After 1 min. stopped drilling because there was a problem with the pumps for circulating water for drilling.
			Max Min Mean	1st ft - 3 min. 2nd ft - 5 min. 3rd ft - 6 min. 4th ft - 10 min. 5th ft - 24 min.		▲ Worked on pumps + blew air through lines on drill rig to clean out. ▲ Resumed drilling @ 1114. ▲ Stopped drilling for lunch at 1156 w/ ~ 3" remaining to be drilled on 5th foot of drilling.
	11:56 to 12:41	N/A	Max Min Mean	N/A	N/A	▲ Lunch break.

Note:

D-104

WOODWARD-CLYDE CONSULTANTS  
LOCKS AND DAM NO. 28  
DRILLED-IN PILE TEST

P. 2 of 2  
Date 1/30/79  
Observer J. Harper

INSTALLATION LOG. PILE NO. DP-3

Depth ft	Time	Description of Material	Torque Pressure lb/in <sup>2</sup>	Thrust Pressure lb/in <sup>2</sup>	Excavation Rate ft/hr	Remarks
	12:41 to 14:05		Max Min Mean	N/A		▲ Resumed drilling ▲ 12:47 Completed drilling + started withdrawing drill rod after flushing the hole for 3 min. ▲ 14:05 Completed withdrawing drill rod + bit.
Casing 131.7 Rock 136.8	14:05 to 15:25		Max Min Mean			▲ Measured depth to top of cutting = 133'1" ▲ Set up bin to receive bailed water + cuttings and started bailing at 1420. ▲ Bailed 6 buckets full Completed bailing at 1525.
	15:25 to 15:50		Max Min Mean			▲ Measured depth to bottom of socket = 136'10" ▲ Removed bailing bucket. Picked up steel stub beam and inserted it into rock socket and released cable.
	15:50 to 16:15		Max Min Mean			▲ Driltech rig prepared to leave DP-3 site (lowering boom, etc.) ▲ Preparing to lower concrete tremie pipe into casing
	16:15 to 17:50		Max Min Mean			▲ started lowering tremie pipe into casing at 1615. Connecting 10' long sections of 6" ID pipe. Last 4 sections of pipe include 3 five ft sections + one 2-ft section pipe all jointed and lowered into the casing
			Max Min Mean			except the last two sections (7 ft). Tip of tremie pipe won't past the top of the stub beam, although some minor jockeying was required to get the tip past the top of the beam. Tip to be lowered tomorrow.
	17:50 to 19:00		Max Min Mean			▲ Crew cleaning up area until end of shift.
			Max Min Mean			

Note: Excavation tool: tricone rotary bit.



Page D-105 through Page D-114  
DRILLED-IN PILE EXCAVATION PROGRESS  
PILE NO. DP1

## DRILLED-IN PILE EXCAVATION PROGRESS

G.S. Elevation: 422Pile No.: DP-1Piezometer Elevation: Top: 422.753Observer: STG RQ DTT

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth In Piez (ft)	Depth from G.S. (ft)		
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground- Water
11/15/78	8:56	20.3	15.7	26.7		25.33	11.0		24.0
	9:32	"	"	30.7			15.0		
	9:44	"	"	31.7			16.0		
	10:37	24.0	12.0	37.0			25.0		
	11:12	28.5	7.5	34.5			27.0		
	11:40	31.0	5.0	34.0			29.0		
	17:00	"	"	"			"		
11/16	0:15	"	23.0	"			"		
	2:10	36.0	18.0	51.0			33.0		
	3:30	"	"	"			"		
	9:00	"	"	"			"		
	10:35	40.0	14.0	49.5			35.5		
	11:50	41.0	13.0	50.5			37.5		
	12:30	"	"	"			"		
	13:30	44.0	10.0	49.0			39.0		
	14:30	"	"	"			"		
11/17	7:00	"	"	"			"		

STG

DTT

RQ

RQ



AD-A076 096

WOODWARD-CLYDE CONSULTANTS CHICAGO IL  
RESULTS AND INTERPRETATION OF DRILLED-IN PILE TEST PROGRAM. EXI--ETC(U)  
JUL 79 J PEREZ , S F GIZIENSKI

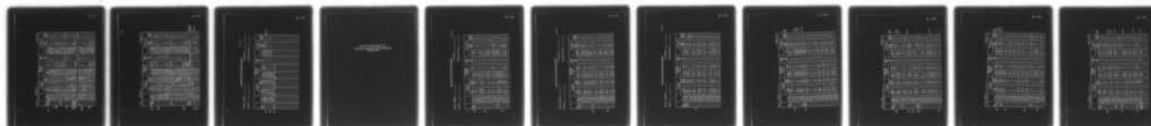
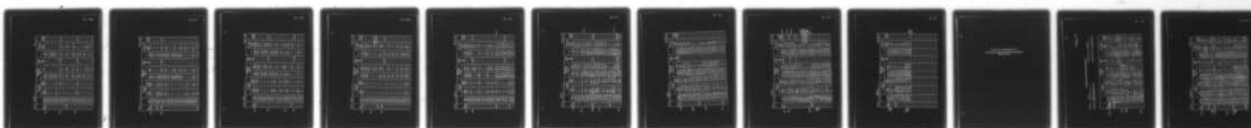
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F/G 13/2

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3 OF 3  
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END  
DATE  
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DDC





Page    of   Pile No.: DP-1

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth in Piez (ft)	Depth from G.S. (ft)		
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground-Water
11/17	8:30	49.0	5.0	48.0			43.0		
	9:00	"	"	"			"		
	9:20	"	"	49.0			44.0		
	9:45	"	"	51.0			46.0		
	10:15	"	"	53.0			48.0		
	10:30	50.0	4.0	52.0			"		
11/18	17:00	"	"	"			"		
	21:00	"	22.0	63.5	53.5	25.33	41.5	31.5	24.0
	21:45	"	"	"	"		"	"	
	23:20	"	"	"	"		"	"	
	0:20	"	"	65.5	57.3		43.5	35.3	
	0:45	"	"	"	"		"	"	
11/18	1:15	"	"	"	"		"	"	
	3:00	"	"	68.9	59.0		46.9	37.0	
	7:00	"	"	"	"		"	"	
	9:00	54.0	18.0	65.0	55.0	25.33	47.0	"	24.0
	9:45	"	"	65.5	"		47.5	"	
	10:00	"	"	"	"		"	"	
	10:50	"	"	66.0	"		48.0	"	
	11:10	"	"	"	57.0		"	39.0	
	14:21	"	"	65.0	2.5		47.0	-15.5	
	15:11	"	"	"	3.0		"	-15.0	
	17:06	"	"	66.0	17.0	25.33	49.0	1.0	24.0

RQ

DTT

RQ

Pile No.:

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth in Piez (ft)	Depth from G.S. (ft)		
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground- Water
DTT	11/18	20:10	54.0	18.0	66.3	19.0	48.3	1.0	
		21:00	"	"	66.7	-	48.7	-	
		21:30	"	"	"	-	"	-	
RQ	11/19	0:00	54.5	17.5	67.4	-	49.9	-	
		3:00	55.0	17.0	68.3	-	51.3	-	
	11/20	7:18	56.0	16.0	68.0	55.0	52.0	39.0	22.0
		9:20	"	"	66.0	-	50.0	-	
		11:20	57.0	15.0	64.0	47.5	49.0	32.5	
		12:00	"	"	65.6	-	50.6	-	
		12:30	"	"	"	-	"	-	
		12:50	"	"	65.8	-	50.8	-	
		13:20	"	"	68.7	56.0	53.7	41.0	
		13:44	"	"	68.0	-	53.0	-	
		14:15	"	"	66.0	-	51.0	-	
		14:40	"	"	65.0	51.0	50.0	36.0	
		17:01	"	"	"	-	"	-	
		18:50	"	"	"	51.0	"	36.0	
		19:55	57.1	14.9	"	-	"	-	
		20:55	"	"	"	-	"	-	
		22:00	"	"	"	-	"	-	
		22:30	57.2	14.8	65.0	51.8	51.0	37.0	
		23:00	"	"	"	-	"	-	
11/21	0:15	58.0	14.0	67.0	49.0		53.0	34.0 ?	

DTT

RQ



Pile No.: DP-1

Date	Time	Pipe Length (ft)			Depth From Top of Pipe (ft)		Water Depth In Piez (ft)	Depth from G.S. (ft)		
		In Ground	Above Ground		Soil	Water		Soil	Water In Pipe	Ground Water
DTT	11/21	1:15	60.0	12.0	67.5	62.8		55.5	50.8	
		2:15	65.0	7.0	68.5	65.0		61.5	58.0	
		2:25	"	"	"	48.7		"	41.7	
		2:30	"	"	54.9	"		47.9	"	
		2:45	"	"	56.2	32.0		49.2	25.0	
RQ		3:10	"	"	57.6	27.6		50.6	20.6	
		7:30	"	"	"	"	23.33	"	23.0	22.0
		8:50	"	"	58.5	26.0		51.5	33.0	
		9:40	65.5	6.5	60.0	-		53.5	-	
		11:10	64.5	5.5	62.2	-		56.7	-	
DTT		11:50	"	"	63.5	40.0		58.0	34.5	
		14:30	"	"	"	-		"	-	
		14:45	67.5	4.5	62.0	-		57.5	-	
		17:15	"	"	"	24.0		"	19.5	
		20:00	"	22.5	80.0	42.8		57.5	20.3	
RQ		22:30	68.0	22.0	81.1	"		59.1	26.9	
		23:10	"	"	"	-		"	-	
	11/22	1:20	"	"	"	51.4		"	29.4	
		7:18	"	"	-	-	23.33	-	-	22.0
		9:45	"	"	-	-		-	-	
		11:01	69.0	21.0	81.0	47.0		60.0	26.0	
		12:00	"	"	-	-		-	-	
		12:30	"	"	-	-		-	-	

Pile No.: DP-1

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth In Piez (ft)	Depth from G.S. (ft)		
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground Water
11/22	13:15	69.0	21.0	81.5	42.0		60.5	21.0	
	14:25	"	"	83.0	45.0		62.0	24.0	
	15:40	"	"	83.7	48.0		62.7	27.0	
	16:30	"	"	"	40.0		"	19.0	
	17:00	"	"	"	—		"	—	
11/23	18:10	"	"	"	5.8		"	15.2 (at base G.S.)	
	20:00	"	"	"	20.0		"	1.0 (at base G.S.)	
	2:05	"	"	"	"		"	—	
	3:00	"	"	84.1	43.8		63.1	22.8	
	7:19	"	"	—	21.0		—	0.0	
11/24	8:45	"	"	83.7	"	23.33	62.7	"	22.0
	9:15	"	"	"	—		"	—	
	10:00	"	"	84.1	30.0		63.1	7.0	
	10:50	"	"	"	"		"	—	
	11:40	"	"	85.5	—		64.5	—	
	12:30	"	"	"	—		"	—	
	13:30	"	"	86.0	37.0		65.0	16.0	
	16:00	"	"	"	—		"	—	
	17:15	"	"	86.5	39.0		65.5	18.0	
	18:00	"	"	"	—		65.7	"	
	20:00	70.0	20.0	86.3	44.8		66.3	24.8	
	21:00	71.0	19.0	85.2	47.2		66.2	24.2	
	21:30	"	"	"	—		"	—	

RQ

DTT

RQ



Pile No.: DP-1

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth In Piez (ft)	Depth from G.S. (ft)		
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground-Water
11/25	1:30	72.8	17.2	87.2	51.0		70.0	33.8	
	2:00	"	"	86.7	51.5		69.5	34.3	
	2:45	73.0	17.0	87.0	"		70.0	34.5	
	7:30	"	"	"	41.0	23.33	"	24.0	22.0
	8:15	"	"	"	38.0			21.0	
	8:45	"	"	"	"			"	
	9:30	73.5	16.5	87.8	41.0		71.3	24.5	
	11:25	"	"	"	"		"	"	
12/12	12:00	"	"	"	"		"	"	
	12:30	"	"	"	"		"	"	
	13:00	74.0	16.0	86.0	40.0		70.0	24.0	
	13:05	"	"	"	35.0		"	19.0	
	14:35	74.5	13.5	"	30.0		70.5	22.5	
	17:00	"	"	"	"		"	"	
	10:15	75.0	15.0	84.0	36.0		69.0	21.0	
	12:45	"	"	86.0	35.0		71.0	20.0	
	14:05	"	"	86.4	36.0		71.4	21.0	
	15:16	"	"	87.5	37.5		72.5	22.5	
	16:15	"	"	88.0	38.6	26.50	73.0	23.6	25.17
	17:10	"	"	88.5	35.0		73.5	20.0	
12/13	07:30	76.0	14.0	87.75	37.0		73.75	23.0	
	09:00	77.0	13.0	88.0	36.0		75.0	23.0	
	10:10	78.0	12.0	87.4	35		75.4	23.0	

OTT

RQ

dup in

Pile No.: DP-1

Page 7 of 10

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth in Piez (ft)	Depth from G.S. (ft)		
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground Water
RQ	12/13	78.0	12.0	88.0	35.4		76.0	23.4	
	12:45	"	"	"	36.5		"	24.5	
	14:00	"	"	89.5	37.5		77.5	25.5	
	14:35	"	"	"	35.0		"	23.0	
DTT	16:50	81.0	9.0	90.0	—		81.0	—	
	18:10	"	"	88.5	32.5		79.5	23.5	
	19:50	83.0	7.0	88.5	22.1		81.5	15.1	
	22:40	"	"	89.9	26.5		82.9	19.5	
RQ	23:15	84.5	5.5	89.0	17.5		83.5	12.0	24.67
	07:20	85.5	4.5	87.1	16.5	26.0	82.6	"	
	13:45	87.0	21.0	105.0	34.0		84.0	13.0	
	14:35	89.0	19.0	104.75	41.0		85.75	22.0	
DTT	16:00	90.0	18.0	105.0	36.0		87.0	18.0	
	17:05	"	"	106.0	44.0		88.0	26.0	
	19:10	92.0	16.0	105.4	24.1		89.4	8.1	
	20:30	"	16.0	107.5	26.8		91.5	10.8	
RQ	22:30	95.0	13.0	107.0	—		94.0	—	
	00:00	96.0	12.0	107.25	—		95.25	—	
	00:55	98.0	10.0	105.25	—		95.40	—	
	01:20	99.75	8.25	102.75	19.25		94.50	11	
RQ	02:50	"	"	105.00	32.25	26.25	96.75	24	24.22
	07:15	100.0	8.0	104.70	33.00	25.30	96.70	25	23.97
	07:35	100.0	8.0	104.70	—	—	96.7	—	—

Blow

Loosening

D-111



Page 8 of 10

File No.: DP-1

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth in Piez (ft)	Depth from G.S. (ft)		
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground Water
R-Q	10/11/5	08:45	101.0	7.0	104.0	18	97.0	11	23.97
		10:35	100.0	8.0	106.6	34	98.6	26	
		11:06	100.0	11	106.25	29	98.25	21	
		11:30	102.50	5.5	104.5	27.5	99.0	22	
		13:15	101.0	7.0	106.5	21.0	99.50	14	
		14:30	104.0	4.0	103.55	24.0	99.55	20	
DTT		19:00	104.0	22.0	121.5	—	99.50	—	
		21:30	104.3	21.7	121.7	—	100.0	—	
		23:15	105.5	20.5	123.5	—	103.0	—	
	12/16	00:30	106.0	20.0	124.25	—	104.25	—	
		02:15	107.0	19.0	123.25	—	104.25	—	
		03:00	107.0	19.0	124.90	—	105.90	—	
R-Q		07:15	106.5	19.5	124.50	29.5	105.0	10	
		08:45	106.5	19.5	125.8	26.5	106.3	7	
		11:45	110.0	16.0	123.5	27.0	107.5	11	
		14:00	"	16.0	123.6	38.0	107.6	22	
		15:00	110.6	15.4	123.5	39.4	108.1	24	
		16:30	"	15.4	123.9	41.4	108.5	26	
DTT		17:30	113.0	13.0	123.1	27.0	110.1	16	
		18:30	"	13.0	124.0	25.0	111.0	12	
	12/17	00:50	115.5	10.5	123.5	—	113.5	—	
		02:20	"	10.5	125.0	—	114.5	—	
		03:05	116.12	10.0	125.0	—	115.0	—	

Page 7 of 10

Pile No.: DP-1

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth in Piez (ft)	Depth from G.S. (ft)		
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground-Water
12/18	07:45	116.0	10.0	123.5	21.5	26.0	113.5	12.0	24.87
	10:00	"	10.0	125.25	9.5		115.75	0.0	
	11:34	116.3	9.7	124.80	10.2		115.1	0.5	
	11:47	116.5	9.5	125.60	9.6	26.33	116.1	19.1	25.0
	12:30	118.0	8.0	123.75	20.0		115.75	12.0	
	13:05	"	8.0	124.75	22.0		116.75	14.0	
	13:46	118.5	7.5	124.6	37.5	26.00	117.10	30	24.67
	14:30	119.0	7.0	124.0	11.0		117.0	4	
	15:53	120.5	5.5	124.1	19.5		118.6	14	
	16:41	120.5	5.5	124.8	—		119.3	—	continuously adding water
	16:36	120.5	5.5	125.25	—		119.75	—	continuously adding water
	16:42	121.3	4.7	124.30	—		119.6	—	continuously adding water
	21:30	121.3	22.7	141.7	—		119.0	—	continuously adding water
12/19	00:00	122.5	21.5	143.75	—		122.25	—	
	03:10	124.0	20.0	142.75	18.0		122.75	+2	
	07:30	"	20.0	143.0	26.0		123.0	6	
	09:40	126.0	18.0	141.0	14.0		123.0	+4	
	10:18	"	18.0	142.0	18.0		124.0	0.0	
	11:30	127.0	17.0	143.0	17.0		124.0	0.0	
	13:04	"	17.0	143.6	18.0		124.6	1.0	
	14:16	127.25	16.75	141.75	12.75		125.0	+4	
	15:00	"	16.75	142.0	13.75		125.25	+3	
	15:50	"	16.75	142.85	12.75		126.10	+4	

RQ

SF6

D77

RQ

SF6



DP-1

## Pile No.3

[illegible]

END  
DP-1

DTT  
SAB

R.Q  
SFB

Page D-115 through Page D-119  
DRILLED-IN PILE EXCAVATION PROGRESS  
PILE NO. DP2



SHEET 45

D-115

DRILLED-IN PILE EXCAVATION PROGRESS

File No.: DP-2 G.S. Elevation: ~422  
 Observer: R.Q/SF6/D.TT Piezometer Elevation: 422.753

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth in Piez (ft)	Depth from G.S. (ft)		
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground Water
12/20/78	16:50	0	18	18	—	—	0	—	—
	17:10	13.5	4.5	4.5	—	—	0	—	—
12/21	00:30	24.0	12.0	27.5	—	—	15.5	—	—
	02:20	27.5	8.5	33.0	—	—	24.5	—	—
	02:50	30.0	6.0	32.30	—	—	26.3	—	—
	03:00	30.0	6.0	32.3	—	—	26.3	—	23.77
	07:45	30.25	5.75	33.45	33.0	25.5	27.7	27.25	24.17
	07:55	30.9	5.10	32.80	32.35	—	27.7	—	—
	16:10	33.6	20.4	49.8	18.0	—	29.4	+2.4	—
	16:55	35.9	18.1	50.5	16.5	—	32.4	+1.6	—
	17:07	"	18.1	51.0	—	—	32.9	—	—
	17:12	"	"	"	21.1	—	"	3.0	—
	18:00	37.7	16.3	50.4	13.3	—	34.1	+3.0	—
	19:00	38.7	15.3	51.7	—	—	36.4	—	—
	19:25	"	15.3	52.7	—	—	37.5	—	—
	20:08	39.7	14.3	53.4	—	—	37.1	—	—
	20:40	41.5	12.5	52.6	—	—	40.1	—	—

DTT

RQ

SF6

DTT

Pile No.: DP-2 Page 2 of 5

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth in Piez (ft)	Depth from G.S. (ft)		
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground Water
12/21	21:30	42.25	11.75	51.35	—	—	39.6	—	—
	22:50	45.00	9.00	52.00	—	—	43.0	—	—
	00:00	46.5	7.50	52.60	—	—	45.1	Adding	—
12/22	00:55	48.25	5.75	52.50	—	—	46.75	—	—
	02:00	49.75	4.25	51.00	—	—	"	—	—
	07:30	50.00	4.00	51.00	4	26.0	47.00	0.0	24.67
12/27	10:55	50.00	22.00	47.25	69.25	—	"	25.25	—
	11:45	51.33	20.67	69.27	—	—	48.6	—	—
	15:00	54.00	18.00	68.5	—	—	50.5	—	—
	16:00	55.80	16.20	69.1	—	—	52.8	—	—
	17:10	58.00	14.00	70.8	—	—	56.8	—	—
	18:07	61.00	11.00	71.0	—	—	60.0	—	—
	20:00	64.00	8.00	68.0	—	—	62.0	—	—
	22:00	65.00	7.00	70.3	—	—	63.3	—	—
	22:40	67.50	4.50	70.75	—	—	66.25	—	—
12/28	11:30	68.00	4.00	70.25	—	—	66.25	—	—
	19:30	71.25	18.75	86.50	15.75	—	67.75	+3	—
	19:45	73.50	16.50	84.00	13.50	—	70.5	+3	—
	20:00	75.00	15.00	88.00	12.00	—	73.0	+3	—
	21:00	76.00	14.00	88.5	11.00	—	74.5	+3	—
	22:30	76.50	13.50	89.6	10.50	—	76.1	+3	—
12/29	00:50	80.00	10.00	89.0	7.00	26.30	79.0	+3	24.97
	03:00	82.00	8.00	88.0	4.00	—	80	+4	—

DTT

DTT

RF

DTT  
RF



Pile No.:

DP-2

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth in Piez (ft)	Depth from G.S. (ft)		
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground Water
DTT	12/10/71	08:30	84.0	6.0	88.0	—	82.0	—	—
		09:30	85.0	5.0	87.4	—	82.40	—	—
		16:40	86.0	22.0	105.75	—	83.75	—	—
		17:10	86.4	21.6	105.85	—	84.25	—	—
		21:00	88.0	20.0	105.60	16.0	85.6	+4	—
RQ		23:30	89.0	19.0	107.00	13.0	88.0	+6	—
	12/30	00:30	91.0	17.0	106.50	12.0	89.5	+5	—
		01:50	93.0	15.0	106.75	10.0	91.75	+5	—
		03:05	96.0	12.0	106.00	8.0	94.00	+4	24.77
		08:00	98.4	9.60	104.35	—	94.25	—	—
DTT		09:00	99.75	8.25	104.33	—	96.08	—	—
		10:40	104.16	3.84	103.00	—	99.16	—	—
	DTT 12/71	17:30	104.16	21.84	121.00	—	99.16	—	—
	RQ 12/71	22:30	104.16	21.84	121.84	16.84	100.00	+5	—
		24:00	—	—	—	—	—	—	25.17
DTT	1/3	01:30	104.16	21.84	122.22	—	101.08	—	—
		07:00	104.16	21.84	122.92	—	101.08	—	—
		13:45	104.16	21.84	125.04	—	103.5	—	—
		16:15	106.50	19.50	124.96	—	105.4	—	—
		17:15	107.00	19.00	125.08	—	106.08	—	—
RQ		19:00	108.00	18.00	125.08	18.00	107.08	0.0	—
		20:20	111.00	15.00	123.50	15.00	108.50	0.0	—
		22:30	111.00	15.00	124.50	15.00	109.50	0.0	—

Pile No.: DP-2

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth in Piez (ft)	Depth from G.S. (ft)		
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground Water
1/4/77	00:10	113.0	13.0	124.08	13.00	—	111.08	0.0	—
	01:30	113.5	12.5	123.58	—	—	111.08	—	—
	03:00	115.0	11.0	123.00	11.00	—	112.00	0.0	—
	09:30	115.75	10.25	124.00	—	—	113.75	—	—
	11:45	116.25	9.75	124.50	—	—	114.75	—	—
	14:20	117.8	8.20	124.34	—	—	116.16	—	—
	15:10	118.0	8.00	125.00	—	—	117.00	—	—
	16:00	119.75	6.25	124.50	—	—	118.25	—	—
	17:10	121.4	4.60	124.40	—	—	119.80	—	—
1/5	10:55	123.75	20.25	140.65	10.25	—	120.40	+1.0	—
	11:15	124.25	19.75	141.00	—	—	121.25	—	—
	13:50	124.75	19.25	143.00	—	—	123.75	—	—
	15:05	126.00	18.00	143.00	—	—	125.00	—	—
	15:55	127.16	16.84	142.34	—	—	125.50	—	—
	16:30	127.25	16.75	143.00	—	—	126.25	—	—
	21:00	129.25	14.75	142.35	9.75	—	127.6	+5	—
	23:45	130.50	13.50	142.50	10.50	—	129.0	+3	—
1/6	01:30	131.16	12.84	143.14	9.84	—	130.3	+3	—
1/6-1/10	Installation of new cylinder to the rig. No drilling during this period of time.								
	Operation was resumed at 16:30 Jan. 11.								
1/11	16:30	131.16	12.84	142.34	—	—	129.5	+5	—
	19:20	131.16	12.84	142.74	—	—	129.9	+3	—
	22:55	131.75	12.25	143.35	—	—	131.1	—	—

measured  
as per  
spec. in

RQ

DTT

RQ

DTT

RQ



## DRILLED-IN PILE EXCAVATION PROGRESS

Observer: \_\_\_\_\_  
Piezometer Elevation: \_\_\_\_\_[illegible]

Page D-120 through Page D-126  
DRILLED-IN PILE EXCAVATION PROGRESS  
PILE NO. DP3



# DRILLED-IN PILE EXCAVATION PROGRESS

P.1 of 7

Pile No.: DP-3

G.S. Elevation: \_\_\_\_\_

Observer: \_\_\_\_\_

Piezometer Elevations: \_\_\_\_\_

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth in Piez (ft)	Depth from G.S. (ft)		
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground-Water
JH	1/17 11:10	0	18.0	21.0	—	—	3.0	—	—
	11:30	14.0	4.0	7.0	—	—	"	—	—
	18:15	"	"	21.0	—	—	"	—	—
	18:30	23.83	12.17	15.17	—	—	3.0	—	—
	19:00	23.83	12.17	16.17	—	—	4.0	—	—
DTT	20:35	"	"	"	—	—	"	—	—
	21:35	"	"	34.17	—	—	22.0	—	—
	21:55	26.5	9.5	33.58	—	—	24.08	—	—
	22:25	"	"	"	—	—	"	—	—
	22:40	30.0	6.0	32.42	3.0	—	26.42	+3.0	—
JH	23:40	"	"	32.0	—	—	26.0	+4.0	—
	1/18 0:10	30.0	6.0	35.33	—	—	29.33	—	—
	0:20	32.08	3.92	32.09	—	—	28.17	—	—
	8:45	"	21.92	50.09	—	—	"	+7.0	—
	9:40	33.5	20.5	51.5	15.5	—	31.0	+5.0	—
	10:10	36.0	18.0	51.0	13.0	—	33.0	+5.0	—
	10:55	"	"	"	"	—	"	"	—

D-120

## DRILLED-IN PILE EXCAVATION PROGRESS

P. 2 of 7

Pile No.: DP-3

G.S. Elevations:

Observer:

Piezometer Elevations:

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth in Piez (ft)	Depth from G.S. (ft)		
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground-Water
1/18	11:45	38.8	15.2	51.0	10.2	—	35.8	+5.0	—
	12:40	"	"	"	"	—	"	—	—
	13:45	40.9	13.1	52.0	7.1	—	33.9	+6.0	—
	15:15	44.0	10.0	51.5	5.0	—	41.5	+5.0	—
	15:35	45.2	8.8	51.3	—	—	42.5	—	—
	17:00	49.4	4.6	50.1	4.6	—	45.5	+0.	—
1/19	7:00	"	22.6	67.7	—	—	45.1	—	—
	9:30	"	22.6	"	12.6	—	"	+10.0	—
	10:45	50.1	21.9	69.2	—	—	47.3	—	—
	14:30	"	"	"	—	—	"	—	—
	16:00	51.8	20.2	69.2	—	—	49.0	—	—
	16:55	55.3	16.7	67.8	—	—	51.1	—	—
	17:10	"	"	"	—	—	"	—	—
	18:25	56.6	15.4	69.4	5.4	—	54.0	+10.0	—
	19:00	"	"	"	—	—	"	—	—
	20:35	60.1	11.9	70.0	7.9	—	58.1	+4.0	—
	21:55	62.5	9.5	70.3	6.5	—	60.8	+3.0	—

JH

RQ



R 3 of 7

## DRILLED-IN FILE EXCAVATION PROGRESS

File No.: DP-3

G.S. Elevations

Observer:

Piezometer Elevations

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth in Piez (ft)	Depth from G.S. (ft)		
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground-Water
1/19	22:50	66.1	5.9	67.6	0	—	61.7	+6.0	—
1/20	1:05	67.1	4.9	69.3	1.9	—	64.4	+3.0	—
	1:15	68.1	3.9	68.3	—	—	"	+3.0	26.0
	5:30	"	21.9	"	—	—	"	—	—
	6:30	68.1	21.9	87.5	11.9	—	65.6	+10.0	—
	8:15	"	"	"	—	—	"	—	—
	9:05	71.1	18.9	85.7	6.9	—	66.8	+12.0	—
	10:00	72.6	17.4	87.0	7.4	—	69.6	+10.0	—
	10:20	"	"	"	—	—	"	—	—
	11:20	75.0	15.0	87.0	7.0	—	72.0	+8.0	—
	11:45	"	"	?	—	—	?	—	—
	12:30	"	"	"	—	—	"	—	—
	13:20	77.7	12.3	86.4	6.3	—	74.1	+6.0	—
	14:25	79.2	10.8		5.8	—	76.2	+5.0	—
	15:40	80.2	9.8	88.1	7.8	—	78.3	+2.0	—
	16:20	"	"	"	—	—	"	—	—
	16:40	82.1	7.9	86.9	2.9	—	79.0	+5.0	—

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D-123

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Pile No.: DP-3

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth in Piez (ft)	Depth from G.S. (ft)			idle time
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground Water	
1/20	17:45	82.1	7.9	86.9	2.9	—	79.0	+5.0	—	
	18:40	83.3	6.7	87.7	3.7	—	81.0	+3.0	—	
	19:00	"	"	"	4.7	—	"	+2.0	—	
	21:00	"	"	89.3	"	—	82.6	-2.0	—	1 hr.
	21:55	84.3	5.7	88.5	3.7	—	82.8	+2.0	—	25 min.
	22:55	84.3	5.7	89.5	3.7	—	83.8	-2.0	—	15 min.
1/21	0:00	86.0	4.0	87.8	2.0	—	83.0	-2.0	—	
1/22	8:00	"	22.0	104.2	33.0	—	82.2	-11.0	—	
	8:50	86.0	22.0	107.0	11.0	—	85.0	+11.0	—	Blow up
	9:10	"	"	"	—	—	"	—	—	
	9:25	"	"	NA	—	—	NA	—	—	
	11:20	"	"	"	—	—	"	—	—	
	11:40	NA	NA	NA	—	—	NA	—	—	
	12:35	"	"	"	—	—	"	+9.0	—	
	13:05	89.5	18.5	105.5	9.5	—	87.0	—	—	
	13:45	"	"	"	—	—	"	—	—	
	14:45	90.2	17.8	106.5	16.8	—	88.7	+1.0	—	
	14:55	"	"	"	—	—	"	—	—	
	15:45	92.7	15.3	105.0	14.3	—	89.7	+1.0	—	
	16:00	"	"	"	—	—	"	—	—	
	17:00	91.9 (?)	16.1	107.4	11.1	—	91.3	+5.0	—	
	18:00	95.3	12.7	105.6	7.7	—	92.9	+5.0	—	
	18:15	"	"	"	—	—	"	—	—	

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Pile No.: DP-3

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth in Piez (ft)	Depth from G.S. (ft)			idle time
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground Water	
1/22	18:45	95.3	12.7	106.3	7.7	—	93.6	+5.0	—	1 hr. 15 min. 15 min
	19:00	"	"	"	8.7	—	"	+4.0	—	
	21:00	90.2	9.8	105.8	—	—	96.0	+5.0	—	
	22:10	99.3	8.7	106.7	—	—	98.0	—	—	
	0:15	"	"	"	—	—	"	—	—	
1/23	2:05	102.5	5.5	106.2	5.5	—	100.7	0.0	—	25 min
	2:30	104.0	4.0	"	—	—	"	—	25.7	
	11:00	"	22.0	122.2	—	—	100.2	+12.0	—	
	11:35	104.0	22.0	123.4	10.0	—	101.4	+12.0	—	
	20:30	"	"	"	—	—	"	—	—	
1/24	21:00	104.8	21.2	123.7	18.2	—	102.5	—	—	15 min
	7:00	105.3	20.7	123.2	—	—	"	-2.0	—	
	7:00	"	"	"	40.7	—	"	-20.0	—	
	9:20	"	"	"	—	—	"	—	—	
	10:15	100.3	17.7	122.2	12.7	—	104.5	+5.0	—	
1/25	12:55	"	"	"	—	—	"	—	—	15 min
	13:55	111.5	14.5	122.3	4.5	—	107.8	+10.0	—	
	14:40	113.0	13.0	124.6	5.0	—	108.6	+8.0	—	
	16:20	113.0	13.0	123.3	8.0	—	110.3	+5.0	—	
	17:25	114.7	11.3	122.4	4.3	—	111.1	+7.0	—	
1/26	18:35	115.5	10.5	123.3	2.5	—	112.8	+9.0	—	15 min
	19:00	"	"	"	—	—	"	—	—	
	20:20	117.2	8.3	123.4	3.3	—	114.4	+5.0	—	

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Pile No.: DP-3

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth in Piez (ft)	Depth from G.S. (ft)			Idle Time
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground-Water	
1/25	21:10	118.0	8.0	123.4	13.0	—	115.4	+5.0	—	15 min
	22:15	119.5	6.5	122.7	1.5	—	116.2	+5.0	—	20 min
	0:25	120.2	5.8	125.2	2.8	—	119.3	+3.0	—	25 min
1/26	0:40	122.0	4.0	123.3	—	—	"	—	—	
	7:30	"	22.0	140.0	—	—	118.0	—	—	
	11:05	"	"	"	—	—	"	—	—	
	11:35	"	"	141.5	7.0	—	119.5	+15.0	—	
	12:35	"	"	"	—	—	"	—	—	
	13:05	"	"	142.7	15.0	—	120.7	+7.0	—	
	16:25	"	"	"	—	—	"	—	—	
	17:25	123.3	20.7	142.2	10.7	—	121.5	+10.0	—	
	18:10	"	"	"	—	—	"	—	—	
1/27	18:45	123.9	20.1	142.8	14.1	—	122.7	+6.0	—	
	20:10	"	"	"	—	—	"	—	—	
	20:30	125.6	18.4	141.1	—	—	"	—	—	
	24:00	"	"	"	—	—	"	—	—	
	0:30	"	"	142.0	14.4	—	123.6	+4.0	25.6	
	1:00	"	"	"	—	—	"	—	—	
1/28	1:25	"	"	143.3	—	—	124.9	—	—	
	13:00	"	"	141.9	—	—	123.5	—	—	
	15:35	"	"	"	—	—	"	—	—	
	16:10	127.7	16.3	141.4	16.3	—	125.1	+0.0	—	
	16:40	"	"	"	—	—	"	—	—	

RQ

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RQ

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P.L.S. No.: DP-3

Date	Time	Pipe Length (ft)		Depth From Top of Pipe (ft)		Water Depth in Piez (ft)	Depth from G.S. (ft)			i/l/e time
		In Ground	Above Ground	Soil	Water		Soil	Water In Pipe	Ground Water	
1/27	16:55	127.9	16.1	142.2	16.1	—	126.1	+10.0	—	
	18:10	"	"	"	—	—	"	—	—	
	18:45	128.9	15.1	141.2	15.1	—	126.1	+0.0	—	
	19:00	"	"	"	—	—	"	+0.0	—	
	20:25	"	"	143.1	10.1	—	128.0	+5.0	—	15 min.
	21:15	130.2	13.8	142.6	8.8	—	128.8	+5.0	—	10 min.
	23:30	"	"	"	—	—	"	—	—	15 min.
1/28	0:15	"	"	143.0	0.8	—	129.2	+5.0	—	
	0:30	131.0	13.0	142.2	—	—	"	—	—	
	5:00	"	"	"	9.0	—	"	+4.0	25.7	
1/29	10:55	"	"	"	—	—	"	+13.0	—	67 min.
	14:10	"	"	143.2	—	—	130.2	—	—	
	14:25	131.2	12.8	143.3	—	—	130.5	—	—	
	15:00	"	"	"	—	—	"	—	—	
	15:25	131.7	12.3	142.8	—	—	130.5	—	—	
	15:55	"	"	"	—	—	"	—	—	15 min.
	17:45	131.7	12.3	144.3	—	—	132.0	—	—	
1/30	7:00	"	0.0	132.1	26.7	—	132.1	-26.7	—	
	11:14	"	0.0	"	—	—	"	—	—	
(rock socket) 12:47		131.7	0.0	136.0	—	—	136.0	—	—	45 min.

RD

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